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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Bound Volume, Proceedings New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF THE SECRETARY,
NEW BEDFORD, MASS., Oct. 26, 1901.

A limited number of copies of the "Proceedings" of the New England Association of Gas Engineers, for the years 1900 and 1901, remain, and single copies can be obtained on application to the Secretary, who will mail them on receipt of $2.

This volume contains several papers and the discussions thereon, and are of especial value for reference. The "Proceedings" of prior years will be published later, and the volumes will be of great value for any gas man's library. N. W. GIFFORD, Secretary.

BRIEFLY TOLD.

AMERICAN GASHOLDERS ABROAD.—While perfectly willing to admit that the first soft breeze of mid-March does not mean the immediate arrival of summer, it is nevertheless true that it (the breeze) is indicative of the fact that the softer season is approaching. And the foregoing sentence was written as a prelude to certain lines concerning a transaction that involved the ability of American firms to compete with English firms in the profitable construction of gasholders in English Colonial districts. A week ago we had occasion to report that the proprietors of the Auckland (New Zealand) Gas Company, on October 16th last, assembled in festive mood to acknowledge the fact that a gasholder, which had been planned in and shipped from America to them, was in the best of working order. The holder is of a good size, in that it will retain or contain 10 per cent. over 1,000,000 cubic feet of gas, under the usual or normal conditions that prevail and control such vessels, so it's an example well to the point of showing magnitude. It was planned by Mr. Chenery Suggate, the Auckland Company's Engineer, and in the competition that followed the proposing of bids for the construction—many prominent firms in this line of construction the world over submitted tenders for the work—the firm of Messrs. R. D. Wood & Company, of Philadelphia, Pa., U. S. A., was awarded the contract. There may not be much in this success of that house; but, as Mr. Suggate said, during the time they were all celebrating the formal "opening" of the holder, it was merely a question of £ s. d. in the amounts of the bids. The Messrs. Wood & Company, in fair and square competition, secured the award and carried out their contract to the full in both letter and spirit. So much for that phase of the case. The fact that any United States firm could be successful in such circumstances, however, seems to have perturbed or disturbed British gas engineering circles to the point of inquiring "the reason why." The *Gas World*, of London, England, in a direct attempt to solve the problem, appealed to several noted English firms in the gasholder construction line for their thoughts respecting the failure of anyone of them to secure the Auckland work. Some of the replies, as the same are reported in our contemporary, over the topic are appended—of course, numbers must stand for names in the catagory:

LIBRARY OF CONGRESS DEC 16 1901 SMITHSONIAN DEPOSIT.

1.—"We do not ourselves feel at all alarmed at an occasional order of this kind going away from this country, as it may often happen that the firm referred to in your article are not always full of work, and are prepared at times, as we are ourselves, to run in at a low figure for such work as at the time it is suitable to undertake. We do not think that America is in a position to beat this country in gasholders, and we have not heard that they have supplied any on this side."

2.—"We were not asked to tender for this holder, from which we infer that the principal gasholder builders in this country were not invited. Without having definite figures before as we are unable to say whether the Americans can really beat us in this department, but we do not think it is so. We have successfully competed against the American builders for gasholder work in Nova Scotia, Canada and South America, and we think we should have an even better chance against them in New Zealand."

3.—"I have some knowledge of Australasia, having resided there a considerable time and visited the principal cities. I should say that America, at any rate, is as well placed as England for the Australian trade, particularly if the gasholder, or any engineering work, was constructed on the site. I have not seen the designs of the gasholder, but if American sections of material were adopted they would be in a better position to compete, as the preparation of special rolls for small quantities of exceptional sections of iron or steel would be very costly, and so place the English makers out of the market. The competition in gasholder construction in this country is so keen as to make the trade scarcely worth attention, and I should judge that the competition in this case was very limited."

4.—"Personally, I think it would be a mistake to lay much importance on the fact that a Philadelphia firm did manage to obtain this one order for the Colonies. I know how hard they have striven to get other orders and have been unsuccessful. It has always struck me that anyone can take an order, if it becomes merely a question of quoting low enough, and circumstances may arise when to take an order, even at a considerable loss, may pay by way of advertisement."

5.—"It is no use our entering into a lot of explanatory details when probably the difference may be small, and might be caused by the firm in question being slack and eager for work, causing them to cut for this job, while the English firms have been well employed in this direction. The firms of this country are quite able to compete with the Americans in the construction of gas apparatus, both as regards price and quality of workmanship."

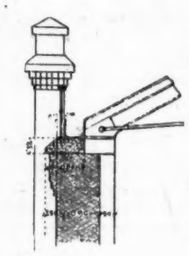
On the whole, the tenor of the explanations is very fair, save in respect of the suggestion contained in No. 3, that Mr. Suggate designed the plan to exclude English builders from a successful chance at the "job;" and by the thoughts put out in Nos. 4 and 5, that the Wood concern is so hungry for work that it will take it at any price. Not so; nor more so than other American firms, the majority of which are not in trading for the actual work that is in it. The last sentence of No. 5's reply is more than amusing; that is, if gas meters and purifying systems are to be considered as "gas apparatus."

NOTES.—Mr. George M. Wilhelm, formerly in charge of the works of the Penn Yan (N. Y.) Gas Light Company, has been appointed Superintendent of the Madison County (N. Y.) Gas and Electric Company, the central station of which is at Oneida, N. Y.——Mr. S. J. Ward, official gas inspector for Memphis, Tenn., reports that the average illuminating value of the gas supplied by the local Company during the month of November was 20.2 candles.——The coal supplies of the Sagahadoc Light and Power Company, of Bath, Me., which concern includes the properties of the old Bath Gas Light Company, were much curtailed early this month through a fire, the cause of which is charged to spontaneous combustion.——Mr. Ira B. Allen, who since 1890 served the Springfield (Mass.) Gas Light Company as Treasurer, has resigned from its service. His successor is Mr. Eugene Milliken, of Providence, R. I.——The properties of the Citizens Gas and Fuel Company, of Terre Haute, Ind., have been purchased by the controllers of the Union Gas and Electric Company, of this city. In the primary reorganization the following officers were elected: President, Richard S. Storrs; Vice-President, E. E. Witherby. The desire of Mr. John McIlhenny, of Philadelphia (who has controlled the Company for some years) to gradually concentrate his business interests is the only reason for the change in ownership at Terre Haute.——Quite a few additions to the purifying and condensing divisions of the plant formerly operated by the Northern Liberties Gas Company, of Philadelphia, have been arranged for.——The proprietors of the Atlas Pipe Wrench Company inform us that they are now ready to deliver Atlas tube cleaners of the inch size.

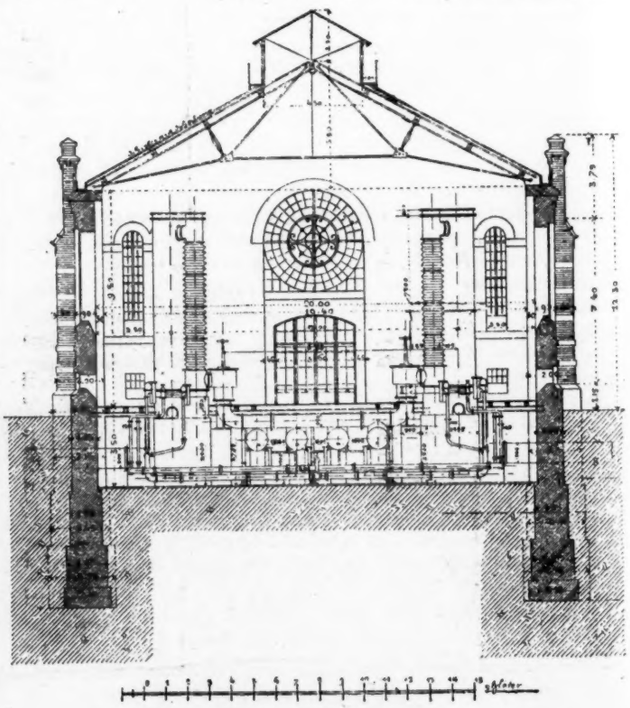
[Continued from Page 923.]

The Vienna Municipal Gas Works.[1]

The Condenser House.—This building is parallel to the retort house, and is 271 feet 8 inches long, and 65 feet 6 inches wide. From the accompanying cross section, it will be seen that there is a basement, 11 feet 6 inches in height, in which are all the mains and connections, and the foundations of the condensers. The floor of the basement is a thick layer of concrete, on which rests the columns that support the gangways on the ground floor. The height from the ground floor to the roof supports is 31 feet 2 inches. The construction of the roof is clearly seen from the cross section. Along the middle is a large lantern for ventilation.



The condensers are arranged in 4 groups along the walls of the house. Each group comprises 2 sets of 7 cylindrical shells, 27 feet 2 inches in height. Each shell is nearly 5 feet



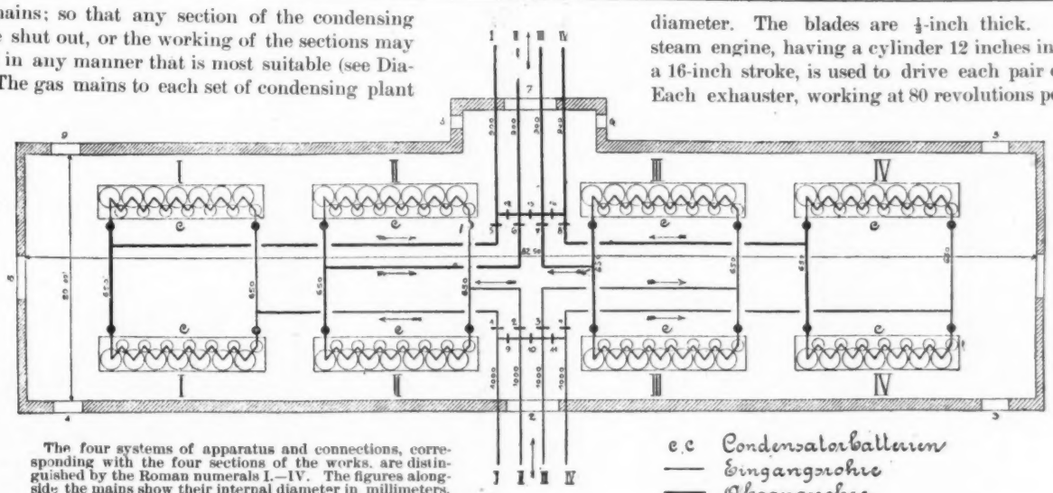
Cross Section of the Condenser House.

in diameter, and within it is an inner shell 39 inches in diameter; while through the annular space run 20 Mannesmann tubes, 5 inches in diameter and ¼ inch thick. The condensing water circulates through these tubes; and the crude gas is therefore cooled both by the air around the shells and by the circulated water. The cylinders have closed water chambers at the top; and the water circulates under pressure throughout the condensing system. The 7 condensing cylinders are connected by means of 7 Mohr's cast iron serrated pipes, 27 feet 2 inches high, and 27½ inches in diameter at the constricted parts. Within each of these pipes is a second pipe, likewise serrated, and 5 inches in diameter where constricted. This pipe serves for the circulation of water. The outer surface of this pipe is sprinkled with gas liquor, in order to prevent tar settling on it. Each set of condensing plant presents a surface to the gas of 4,950 square feet cooled by water, and 6,135 square feet cooled by air; and it is intended to deal with a maximum of 2,225,000 cubic feet of gas per diem. Each condensing cylinder has a 5-inch outlet for carrying off the products of condensation. The products are conveyed through a 10-inch pipe to a collecting tank, from which they are pumped to the storage tanks on the other side of the main drain of the Eleventh District, which, as already mentioned, passes through the works.

The four 40-inch mains by which the gas travels from the retort house, are connected directly they enter the condenser house by a cross main. They are then reduced to 36 inches for a short distance before they branch right and left to the condensing apparatus. There are 3 valves in the cross main, and one in each of the 36-inch prolongations

1. *Journal of Gas Lighting.*

of the inlet mains; so that any section of the condensing plant may be shut out, or the working of the sections may be combined in any manner that is most suitable (see Diagram A). The gas mains to each set of condensing plant



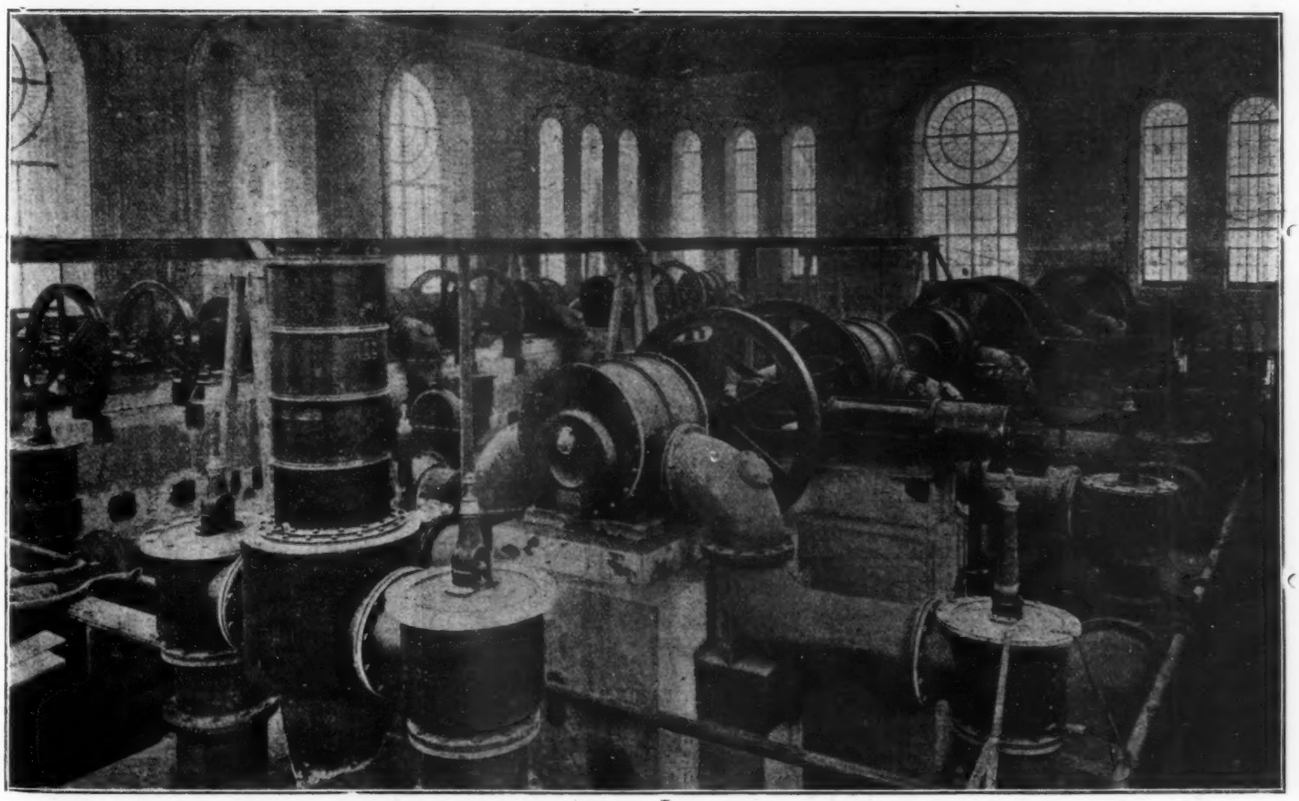
The four systems of apparatus and connections, corresponding with the four sections of the works, are distinguished by the Roman numerals I.—IV. The figures alongside the mains show their internal diameter in millimeters.

[Translation: "Condensatorbatterien," Set of Condensers. "Eingangsrohre," Inlet Mains. "Abangsrohre," Outlet Mains. "Scheiber," Valves. "Hydraul. Ventile," Wet Valves.]

Diagram A.—Arrangement for Condenser House.

are 25½ inches in diameter, and each one is provided with a hydraulic valve with a 24½-inch seal; so that any set can be shut out at will. The arrangement of the outlet mains is similar to that of the inlet mains. The plates used for the cylinders were tested under an air pressure of 5 atmospheres, and the finished sets under an air pressure of 24 inches head of water.

Exhausters.—The exhausters, which draw the gas from the retorts and condensers and force it through the remaining apparatus, are in the body of the exhauster house, which is nearly 112 feet long and 75 feet 6 inches wide. In the wings are an office for the foreman, a small workshop, lavatories, etc. The connections are in the basement, which is 11 feet 6 inches high. The floor of the exhauster room above it is supported on concrete resting on an iron framework. The walls are lined with Dutch tiles to a height of 6 feet. Two 3-blade exhausters are provided for each of the 4 sections. The outer drums are 37½ inches in diameter and 37½ inches long, and the internal drum is 26½ inches in diameter. The blades are ½-inch thick. A horizontal steam engine, having a cylinder 12 inches in diameter and a 16-inch stroke, is used to drive each pair of exhausters. Each exhauster, working at 80 revolutions per minute, has a capacity of 106,000 cubic feet per hour, against a pressure of about 16 inches of water. The 8 exhausters and 4 engines are placed in the corners of the room; and in the middle there are two reserve sets, each of two exhausters and one engine. One of these sets may be at once substituted for either of the other sets. The steam, brought by 2 pipes from the adjacent boiler house, is used at a pressure of 6 atmospheres; and the exhausts of all the engines are connected to 1 pipe. The steam



The Exhausters in Course of Erection.

supply to each engine is controlled by a Hahn regulator as well as by the valve. The usual gas governors are also provided for opening a bye-pass valve between the inlet and outlet mains, in case of any interruption or change of pressure. The 4 inlet gas mains enter the building at the south end, and run along the walls to the plant.

They are 36 inches in diameter, and are connected by a 36-inch cross main with valves (see Diagram B). The ports of the exhausters are 20 inches in diameter, and can be shut off by dry valves. All the 4 outlet mains can be connected by means of a 36-inch con-

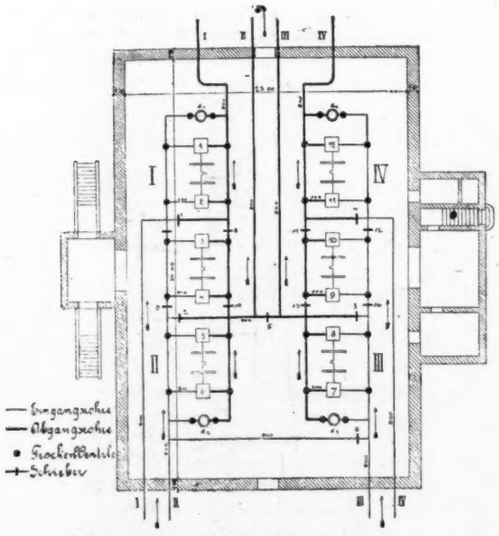
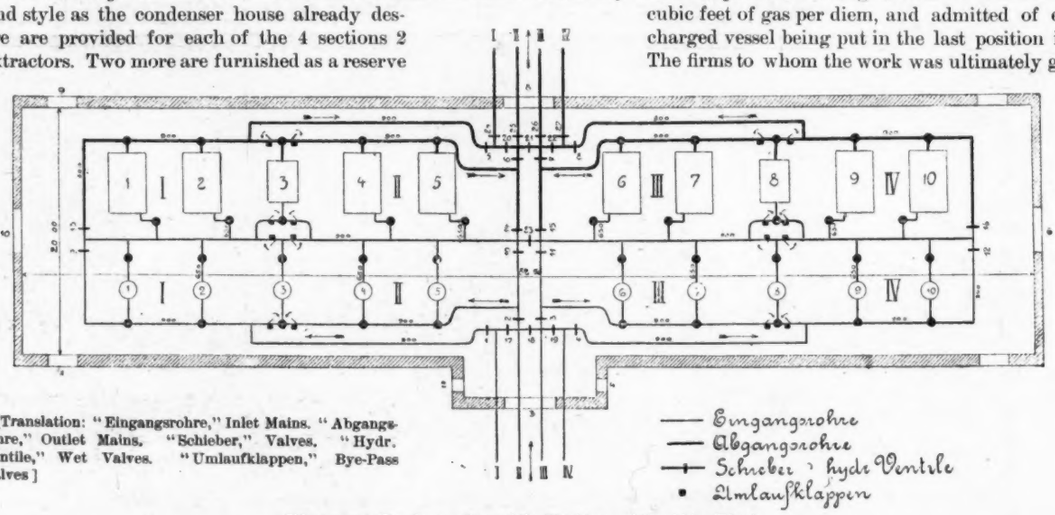


Diagram B.—Exhauster House Connections.

[Translation: "Eingangsrohre," Inlet Mains. "Abgangsrohre," Outlet Mains "Trocken Ventile," Dry Valves. "Schieber," Valves.]

nection with valves. There are, in all, 46 valves on the connections in the exhauster house. An illustration is given to-day showing the exhausting plant in course of erection; and reference may also be made to the illustration of the interior of the exhauster room as given in the *Journal* for March 26th last.

Washing and Scrubbing Plant.—The scrubber house has the same dimensions and style as the condenser house already described. There are provided for each of the 4 sections 2 Pelouze tar extractors. Two more are furnished as a reserve



[Translation: "Eingangsrohre," Inlet Mains. "Abgangsrohre," Outlet Mains. "Schieber," Valves. "Hydr. Ventile," Wet Valves. "Umlaufklappen," Bye-Pass Valves]

Diagram C.—Connections of the Washing and Scrubbing Plant.

and are automatically brought into use by means of flap valves weighted to the normal gas pressure. Each extractor has a capacity of 2,300,000 cubic feet per diem. Two "Standard" washers are provided for each section; and, as a reserve plant, there are 2 washers of the Fleischhauer pattern, brought into use automatically in the same way as the reserve tar extractors.

The gas passes from the Pelouze extractors to the Standard washers, which reduce the ammonia in the gas to less than ½ grain per 100 cubic feet. On an average, 1¼ gallons of clean water are required in the Standard washers per 1,000 cubic feet of gas; and the liquor leaves them with a strength of from 2.8° to 3.6° Beaumé (about 8 to 10 ounces). The reserve Fleischhauer washers are vessels of sheet iron, 20 feet 8 inches high, 7½ feet wide, and 11 feet deep. They are packed with metal strips on the slope, venetian blind fashion; and these are sprinkled with water or liquor by a tipping bucket device at the top. The gas flows upward through these washers. Each washer has a capacity of 2,300,000 cubic feet of gas per hour. The inlet and outlet mains to the house are all 36 inches in diameter. The inlet and outlet mains to each extractor and washer are 25½ inches in diameter (see Diagram C). The disposition of the mains and valves of the house is shown in the same diagram. The valves admit in each set or each extractor or washer being shut out as required. The tar and liquor run into 2 collecting tanks, from which they are pumped into the storage tanks on the far side of the main drain already mentioned, by means of 2 pumps, each delivering 1,320 gallons per hour. The same pumps can also be used to transfer weak liquor to an overhead tank, from which it is run into the Standard washers. A proposal, made after the erection of the plant had been commenced, to modify the washing apparatus so as to adapt it for the recovery of cyanogen according to Bueb's process, fell through because the contracts had already been made. A view of the interior of the scrubber house was given, together with other details of its arrangements, in the *Journal* for April 2d last.

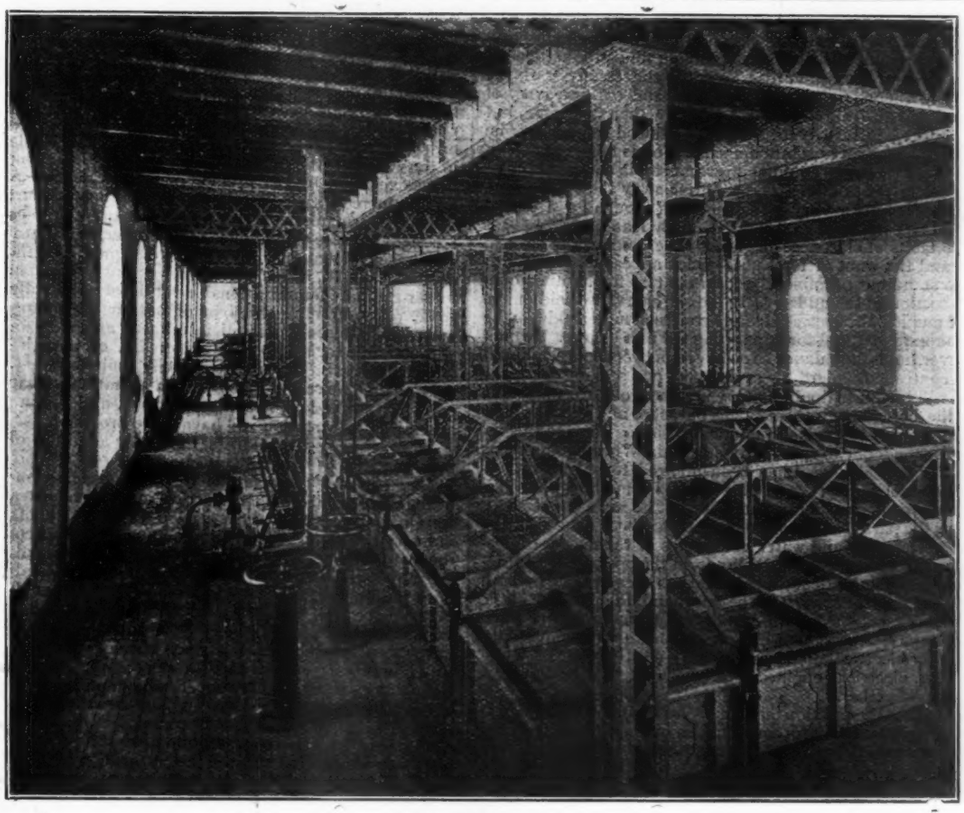
Purifying Plant.—The original scheme of Herr Herrmann embodied

End View of the Purifier Houses.

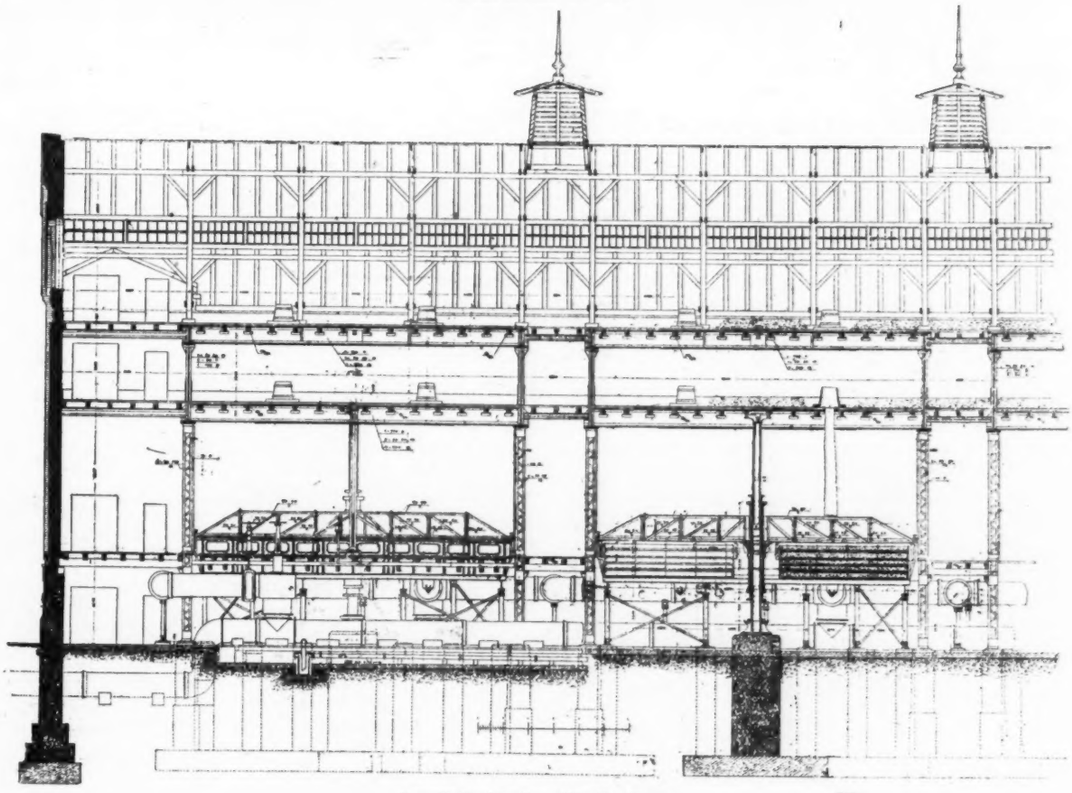
the erection of one large purifying house containing 16 vessels about 40 feet square. Latitude, however, was given to the firms tendering for the provision of purifying plant to submit alternative schemes, provided they were adapted for dealing with a minimum of 17½ million cubic feet of gas per diem, and admitted of every freshly charged vessel being put in the last position in the series. The firms to whom the work was ultimately given adhered to the number of vessels proposed by Herr Herrmann, but adopted a simplified system of connections, by which only 16, in place of 48, valves were required. The scheme contemplates only the employment of hydrated ferric oxide for the removal merely of sulphureted hydrogen and cyanogen from the gas.

The Constructing Committee decided to have the vessels placed in 2 houses, with an intervening space, 52 feet 6 inches wide, for use as a revivifying floor (see Fig. 16). Each building is 468 feet 10 inches long and 64 feet wide, inside measurement, and is divided by a transverse wall into 2 equal blocks; so that there is in reality a separate purifying house for each of the 4 sections of the works. The ground floor is occupied by the connections, the columns which support the vessels, and the arrangements for the removal of fouled material. The first floor is 19 feet 4 inches high, and contains the vessels and the appliances for operating the valves and for raising the lids of the vessels. Above this are 2 floors, both intended for the storage of purifying material.

The floors are constructed on roofs consisting of rails resting on piers; and those above the vessels are asphalted, in order to prevent the water used in preparing the oxide for use from running through. The roof framing is supported by lattice columns, on which rest plate girders for carrying the bearers which run parallel with the wall. The roof of the ground floor is partly supported from the sides of the ves



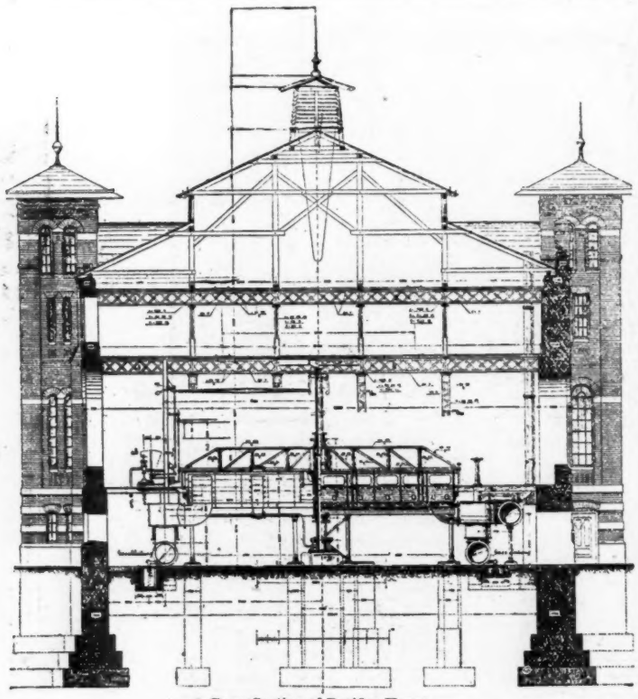
Interior of Purifier House.



Longitudinal Section of Purifier House.

sels, which are equipped with brackets. On the four corners of each house there are staircases to all floors; while there are additional staircases in the middle to the first floor, where the vessels are.

The purifying vessels are rectangular boxes 39 feet 4 inches square. The bottoms and sides are of cast iron; the lids being of asphalted iron sheets, which are stiffened by a lattice framing of 4 longitudinal and 4 cross girders, 40 inches high, with 2 secondary rolled 4-inch joists between adjacent girders. A reproduction of a photograph of the interior of the purifier house will show the arrangement. The soundness of each vessel was tested under an air pressure of 24 inches head of water, at which the lid had to withstand a total pressure of about 85 tons. The cast plates for the sides of the vessels are 48 inches square and ¼-inch thick, with cast-on cups. The dip sheets of the lid are ¾ inch thick, and the roof sheets ⅛ inch thick. The 16 ends of the roof girders are



Cross Section of Purifier House.

against a pressure of 60 atmospheres. The lids of 2 purifiers can be raised simultaneously.

The working of the apparatus can be followed by reference to the longitudinal and cross sections. A hollow column extends from the ground floor to the ceiling of the first floor. Its lower half is 16 inches in diameter; its upper half 12 inches. On it slides the cylinder of a hydraulic press, 23½ inches outer and 17¾ inches inner diameter. This carries the lid of the purifier, weighing nearly 19 tons. The water, at 60 atmospheres pressure, flows in at its base to the hollow space in the column, which it fills, and then passes through holes at the junction of its different sized halves into the hollow space of the cylinder. The reduction of the size of the column at its upper half gives a greater cross section of water on the upper than on the lower side of the pressure cylinder. Therefore the cylinder, together with the attached lid of the vessel, is raised. The operation is controlled by an ordinary type of slide valve, actuated by a hand reversing lever. At its highest position, the lid is automatically clinched by 2 hooks on the column, which retain it in that position independently of the hydraulic press. As soon as the lid has reached the highest point, the water is automatically shut off. Up to now, this hydraulic lifting apparatus has answered very well.

Each purifier requires about 130 cubic yards of material to fill it. On account of the hydraulic apparatus for raising the lid, there has to be a second cup and dip in the middle of the vessel. The lid is guided by means of 2 forked projections, which run on guide rails attached to two of the lattice columns supporting the roof. The scheme of the connections to the vessels is shown in Diagram D. The whole of the connecting mains are 36 inches in diameter. At the end of each main there is a safety seal pot, with a 16-inch pipe leading into the open air above the roof. The object of this arrangement is to prevent a rise of

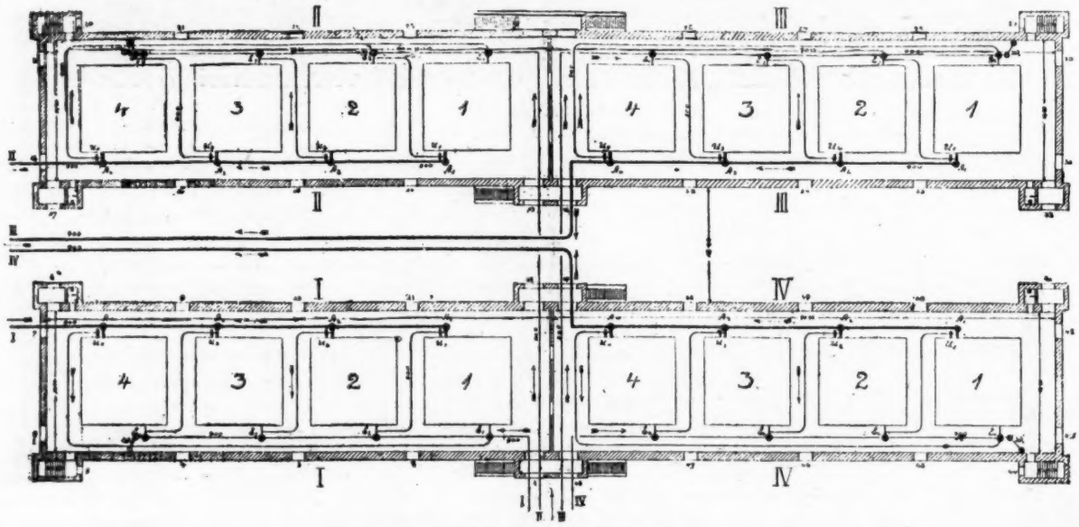


Diagram D.—Purifier House Connections.

clamped by screws to the sides of the vessel, in order to hold down the lid. There are 4 rows of grids for supporting the layers of purifying material in the vessels. For the introduction of the material there are 4 openings, 20 inches wide, in the lid, and over these there are openings in the floors above; so that the material may be brought thence into the vessels by means of flexible shoots. Four openings, also 20 inches wide, are provided in the bottom of each vessel for the discharge of the fouled material into wagons on the tramway which passes directly underneath the openings. These wagons convey it to the revivifying floor, from which lifts raise it to the storage floor. The openings in the lids and bottoms of the purifiers are closed by means of Morton's lids. The vessels are provided with the necessary gauges, test cocks, and other appurtenances. The available area of a vessel amounts to nearly 1,500 square feet.

The substructure of the purifiers is independent of the building, and consists of 18 cast iron columns, 6 feet 11 inches high, on which rest 4 main girders 16 inches deep, which again support 11 girders 8 inches deep, on which the purifiers are directly placed. The lids of the vessels are raised, and the hoists worked, by hydraulic power. The accumulator is in the scrubber house. It has a steel plunger, 10¼ inches in diameter and 22 feet 4 inches high, with a stroke of 16 feet 5 inches. It is loaded with cast iron plates. There are two duplex steam pumps, with plungers 2½ inches in diameter, which deliver 33 gallons of water pressure blowing the lutes of the vessels, and thus allowing gas to escape into the building.

The Meter House.—Two station meters, placed opposite one another

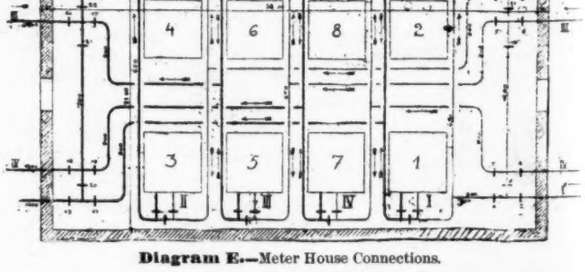


Diagram E.—Meter House Connections.

in the meter house, are provided for each of the 4 sections of the works; and may be used either one at a time or simultaneously. The diameter of each meter is 14 feet 1 inch; its depth is 15 feet 1 inch; and its drum has a capacity of 1,320 cubic feet. At 80 revolutions per hour, each

meter passes 106,000 cubic feet of gas; hence the 8 meters are equal to measuring a daily make of at least 17¼ million cubic feet. The tanks are of cast iron, with the joints carefully planed. On the bottom of each is fitted a settling box, provided with a discharge valve. There are 4 partitions in the drums. The partitions are of tinned iron sheets, ⅛-inch thick.

The faces of the meters have the usual index, with 7 dials, thermometer, pressure gauge, clock, and recording apparatus. At the back are the inlet and outlet connections, the water inlet and overflow, lubricators, and other accessories. Pressure gauges connected to the inlets and outlets of each meter are mounted on one pedestal in the meter house. The disposition of the connections and valves in the meter house is shown in Diagram E. The four 36-inch mains from the purifying house are all connected by a 48-inch cross main, which is provided with 3 valves; while there are also valves in the 36-inch connections on both sides of it. The arrangement of the outlet connections from the meter house is similar; but the outlet mains are 48 inches in diameter. The 36-inch inlet mains are each jointed to a 25½-inch main, which runs round the pair of meters belonging to the section, and is connected to their inlets and outlets. There are in all 46 valves in the meter house, all actuated by hand wheels. For facilitating the work of the valve men, there is provided an electric recorder of the positions of the gasholders.

The meter house consists of a ground floor room nearly 125 feet long by 65 feet 7 inches wide, and 27 feet 2 inches high to the roof supports. A view of this floor was given in the *Journal* for April 2d last. There is a basement, about 13 feet high, in which all the connections are exposed and readily accessible. The subsoil at the spot selected was found to be particularly unfavorable; and a firm foundation had to be secured by means of a continuous bed of concrete 32 inches thick.

[To be Continued.]

Analysis of Ammoniacal Liquors.

Some months ago, Mr. R. Forbes Carpenter, Chief Inspector under the Alkali Works Regulation Acts (Great Britain), made public mention of sensible methods of analyzing ammoniacal liquors. His most recent remarks on the topic contain many good points. A fair summary of them is appended:

The estimation of the sulphur present as sulphate, sulphocyanide, and sulphide, was considered to be satisfactorily solved; but that of the thiosulphate was still a matter of some uncertainty, as the sum of the sulphurs present as sulphate, sulphocyanide, thiosulphate, and sulphide, in the case of liquors from gas works rich in sulphides, was almost invariably found to be less than that of the "total sulphur" determined by bromine oxidation (the difference appearing as a *positive* percentage figure in the table of analyses); while often, in the case of coke oven and similar liquors, where the sum of the components exceeded that of the total sulphur, the difference figure was *negative* in sign. In explanation of these "difference" figures, it was assumed that a positive figure marked the presence of polysulphide and sulphur in forms of combination other than those named above; while a negative figure was taken to be an indication of the extent to which the organic matter present had interfered with the iodine titrations.

Since the report was written, however, analyses of liquors of character somewhat different from those available at that time have rendered it necessary to modify in some respects the earlier conclusions arrived at regarding the meaning of the negative sign spoken of above, while affording complete confirmation of the correctness of the assumptions regarding the presence of polysulphide. These exceptional liquors have indicated the presence of sulphite rather than organic matter as the disturbing factor, which in the presence of mineral acids, there is reason to believe, has far less reducing action on iodine than one was previously led to suppose. As regards the presence of sulphite, it is clear that in the separation of the sulphide by zinc salt it will pass into the filtrate with the thiosulphate, and will exert there a reducing action upon the iodine used for titration. As the factor of conversion of $\frac{N}{10}$ iodine into sulphur for thiosulphate is 4 times as great as that for sulphite, it is evident that, unless due allowance is made for the latter, the figure for sulphur as thiosulphate will largely exceed its proper value, and a corresponding error will be introduced into the "difference" figure obtained as described above; the latter thus being made to assume a negative sign in the absence of polysulphide. (Polysulphide and sulphite cannot co-exist in the same solution.)

The estimation of sulphite in ammoniacal liquors offers extreme difficulty. The amount, in general, bears too small a proportion to the organic matter present to enable Richardson and Aykroyd's joint iodine and acidimetric method to be applied with any hope of success; and when this is the case, the presence of sulphite can only be conjectured from the appearance of a large "difference" figure of negative sign. Even when the amount of sulphite is large, the end point of the acidimetric titration with methyl orange as indicator is by no means sharp; and the presence of organic matter during the iodine titration is always a source of danger, though it has been found possible to minimize this by the addition of 10 c.c. of $\frac{N}{5}$ hydrochloric acid before proceeding to the titration of the neutralized filtrate from the sulphide. The amount of acid so added must, of course, be allowed for in the subsequent titration with alkali.

Having, however, established the presence of sulphite beyond doubt in certain ammoniacal liquors, it became a matter of importance to determine the conditions under which it could exist in the presence of sulphide, and also how far the presence of thiosulphate in such liquors might be due to the interaction of these bodies in presence or in absence of air.

Before setting out the results of such work, however, it should be stated that later experience has failed to confirm the desirability of extracting the ammoniacal liquor with carbon bisulphide to remove organic matter before proceeding to determine the thiosulphate and sulphide, and has indicated one possible source of danger attending the use of this solvent. This danger is due to the tendency of the bisulphide to react, under certain conditions, with ammonium sulphide to form sulphocarbonate. When the method was first adopted, careful experiments on solution of ammonium sulphide failed to reveal any reduction of sulphide in the liquor from this cause; but it has been ascertained since that certain liquors—*e. g.*, shale liquors—possess the property of causing the carbon bisulphide with which they are shaken to assume a fine vesicular condition, in which state it often remains suspended in the liquor for many hours. Under these conditions, slow reaction takes place between the bisulphide and the ammonium sulphide present; resulting in the formation of sulphocarbonate, and corresponding loss of sulphide. It has, therefore, been thought desirable to abandon altogether the use of bisulphide for such a purpose. Now that the appearance of a negative sign before the "difference" figure has been satisfactorily accounted for in several cases by the presence of sulphite, less importance is attached to the removal of organic matter from liquors where the direct estimation of sulphite has proved impossible, but where its presence may reasonably be expected from the nature of the liquor and the appearance of a large "difference" figure of negative sign.

The methods of analysis described in last year's report otherwise continue the same, with the exception that since the abandonment of the method of extraction of the liquor with bisulphide, separation of the sulphide from the thiosulphate (and sulphite) is now effected by ammoniacal zinc chloride in place of neutral zinc sulphate. It should be added, also, that in the volumetric estimation of the carbonic acid the digestion at 98° C. with ammoniacal calcium chloride, necessary to decompose carbamates and complete the separation of the calcium carbonate, is now carried out in stoppered bottles kept immersed in the water bath for 1½ to 2 hours at boiling temperature, this method being found to yield the most reliable results.

The solutions of sulphite and sulphide used in these experiments were freshly prepared for each series by passing sulphur dioxide and sulphuretted hydrogen respectively into boiled water containing sufficient ammonia or ammonium carbonate to insure the complete saturation of the gases. Analysis of the sulphide solution showed that this method could be relied upon to give a colorless sulphide free from all products of oxidation.

The solution of polysulphide was obtained by diluting with boiled water, strong ammonium sulphide solution that had become yellow by slow oxidation in contact with a limited supply of air. The amounts of sulphur as sulphide and thiosulphate in this solution were determined directly by titration with $\frac{N}{10}$ iodine. The difference between the "total sulphur" determined by bromine oxidation and the sum of that present as sulphide and thiosulphate was taken to be the sulphur present in the form of polysulphide; sulphate and sulphite both being absent.

The reactions between the various salts were all carried out in stoppered bottles of known capacity, kept at constant temperature by means of a water bath. For experiments "in absence of air," bottles of

250 c. c. capacity were found suitable, a space of 5 c.c. being left above the liquid to allow of expansion when the temperature of the bath was raised to 115° F.

At the end of the experiments, the bottles were cooled to air temperature, and an aliquot portion of the liquid removed for determination of the amounts of sulphide, thiosulphate, and sulphite present, by Richardson and Aykroyd's joint iodine and acidimetric method. Conditions were varied as regards temperature, air supply, and presence and absence of ammonium carbonate.

The following table gives the results of the experiments on the oxidation of ammonium sulphide by ammonium sulphite:

Controlling Factor.	Volume of Air above Liquor.	Temperature.	Duration of Experiment.	Sulphite in Terms of Sulphur.	Sulphide. In Terms of Sulphur. Before Oxidation.	Sulphide. In Terms of Sulphur. After Oxidation.	Sulphide. In Terms of Sulphur. "Converted."	"Converted" per Cent. of Total Taken.
Air Absent.	C.C.	F.	Hours.	Grams.	Grams.	Grams.	Grams.	
A —Sulphite—								
Absent.....	0	62	24	Absent	0.1436	0.1414	0.0022	1.5
Present, Time.	0	62	24	0.1298	0.1436	0.1391	0.0045	3.1
			48	0.1298	0.1436	0.1321	0.0045	3.1
B—Temperature Sulphite present—								
Cold.....	5	70	6	0.1251	0.1469	0.1444	0.0025	1.7
Warm.....	5	93	4½	0.1251	0.1469	0.1421	0.0048	3.3
Warm.....	5	115	4½	0.1251	0.1469	0.1405	0.0064	4.4
Air Present.								
A.—Sulphite—								
1. Absent, time	950	62	24	Absent	0.1436	0.1240	0.0196	13.5
			48		0.1436	0.1050	0.0386	26.9
Present, time	970	62	24	0.1298	0.1436	0.1208	0.0228	15.9
			48	0.1298	0.1436	0.0980	0.0456	31.8
2. Absent.....	950	115	2½	Absent	0.1469	0.1316	0.0153	10.5
Present ...	970	115	2½	0.1251	0.1469	0.1360	0.0109	7.5
B—Temperature Sulphite present—								
Cold.....	970	70	2½	0.1251	0.1469	0.1398	0.0071	4.9
Warm.....		115	2½	0.1251	0.1469	0.1360	0.0109	7.5

The following are the conclusions drawn from the experiment: (1) In the absence of air, ammonium sulphite has but little oxidizing action upon ammonium sulphite in the cold. With rise of temperature, the action is more marked, but is still inconsiderable. (2) In the presence of air, oxidation is marked; but the rate of "conversion" in a given time is very little greater than it would be if the same volume of air were allowed to act by itself. (3) Ammonium sulphite and ammonium sulphide can co-exist in the same solution.

Treating of the oxidation of gas liquor by air in stoppered bottles. the results of which are given in another table, Mr. Carpenter remarks: Analysis having constantly pointed to the presence of polysulphide in ammoniacal liquors from gas works, it became of interest to obtain direct confirmation of this by determining whether this body was formed on the oxidation of such liquors by contact with a limited supply of air.

The experiments were carried out in stoppered bottles of known capacity. Conditions were varied as regards temperature, time of contact and relative volumes of air and liquor. The results obtained showed that the oxidation of ammonium sulphide in gas liquor proceeds on the same lines as in an aqueous solution of ammonium sulphide; polysulphide and thiosulphate being the first products of oxidation, and these bodies themselves subsequently undergoing oxidation with separation of free sulphur. The changes are hastened by rise of temperature and by increasing the volume of air relative to liquor. The following is the conclusion drawn from the experiments: That ammonium polysulphide is at once completely converted into a mixture of ammonium thiosulphate and ammonium sulphide by the action of excess of ammonium sulphite; one-half of the sulphur of the thiosulphate formed being derived from the polysulphide, the remaining half from the sulphite, in accordance with the following equation:

$$(NH_4)_2S_5 + (NH_4)_2SO_3 = (NH_4)_2S + (NH_4)_2S_2O_3.$$

Notes on the Alternating Current System of Distribution.

[Read by Mr. W. S. Barstow, at the last meeting of the Am Inst. Elec. Engineers.]

Distributing systems are ususlly referred to under two headings - direct and alternating.

The direct current distributing system, starting in the early '80's, and appearing generally in its 3-wire form, is what may be termed a universal system, since from the same conductors and without any modification whatever at the customer's service, current is furnished direct to any electrical apparatus, whether for supply of power, light or heat.

The alternating current distributing system, making its appearance in its single phase form about the same time as the direct, never started as a means of universal supply, being confined in its earliest stages of development to the furnishing of energy for light and heat only. To the absence of the alternating current motor can probably be traced its restricted use and the early slow progress in this form of current supply. Had there been early developed a single phase motor which would have met all the conditions of a direct current motor in construction, economy and cost, then there is no doubt but that the 3-wire, single phase alternating current system would have come rapidly to the front. As to whether it would take the place at the present time of large installations of direct current supply might, perhaps, be doubtful, since the storage battery as a part of the general system is gaining ground and rapidly becoming indispensable.

The alternating current distributing system was first exploited as a house-to-house supply, and continued as such until within recent years, when efforts were made to interconnect the secondaries to increase the efficiency and reliability of the system. It was soon found, however, that the paralleling of transformers in old systems already erected, through small secondary mains, was much like paralleling compound generators through a small equalizing bus, and many failures were the result. Steps were then taken to install mains of such a size as to make the drop or loss between the two transformers negligible, and for a short time many plants operated successfully with transformers in multiple on fairly long secondary mains. As the demand for current on the mains increased, however, the change in the size of conductors was not followed up, and the old trouble returned. The system to-day, therefore, has almost reverted to a house-to-house supply, although the transformers are arranged in groups, connected to secondary mains, and providing, in case of accident, for interconnection.

The only practical and successful method of paralleling transformers on secondary mains of distribution is the placing of each transformer or bank of transformers on a separate feeder and providing at the station means for regulation on each feeder, so as to make it possible to divide up the load on the different transformers and compensate for any difference in transformer regulation. Such a system is in successful operation in several large plants, and is productive of good results. When the alternating current system is permanently standardized the transformer will no doubt be considered a part of the feeder, only one transformer or bank of transformers being installed at a single distributing point of a single feeder.

As before mentioned, owing to the early absence of any commercial single phase motor, there was no incentive to standardize and develop the alternating system, as has been done in the case of the direct, and it was not until the last few years that the alternating system, by abandonment of the single phase and the change to multiphase, approached anything like a universal system of supply. Up to the time of the appearance of the multiphase motor the development of motor business on alternating systems was very restricted, as the uses to which the single phase motor could be put were more or less limited. On the other hand, the introduction of the multiphase motor necessitated a change in the entire system of distribution, and it is not until the last few years that single phase has entirely given place to multiphase systems, not, in fact, until it became apparent that the multiphase motor, under any stage of development, would prove superior to the single phase. Probably the simplest multiphase alternating current distributing system which would be first thought of would be the 2-phase, 3-wire primary and 3-wire secondary. Such a system might be satisfactory where light only is used and where the middle wire of the secondary system is always kept of proper size to maintain the balance, but there is no doubt that the better commercial form is the 4-wire secondary; or, in fact, the two phases taken directly from the machine to the customer's service. With the same number of conductors, a further saving of copper is secured by the use of the 4-wire, 3-phase. With either of these systems, where transformers are a part of the individual feeder, a complete inter-

connection of mains can be secured. When the supply from these secondary mains is introduced into the premises of the customer, necessity for installation of additional transforming apparatus arises. If the secondary be of a pressure of 110 volts between phases, either large motors must be installed at this pressure or step-up transformers used. In either case the mains must be very large to take care of this low pressure motor current, and especially when such multiphase motors are frequently stopped and started. If the secondary be of a pressure of 220 volts, the size of conductors can, of course, be reduced, but it is still necessary to install a transformer or balancing device if 110-volt arc or incandescent lamps are used.

With the object of simplifying the system, in many cases the multiple network of secondary mains has been omitted, and in their place a multiple network of primary mains substituted, the transformers being located on the premises of the customers. This reduces the system to a house-to-house supply and makes necessary the building of vaults or in other ways satisfying the insurance companies, as the full pressure is introduced into the premises of the customer. Such an arrangement necessitates an increase in the transformer capacity of the system, since the capacity of the transformers must be nearer the capacity of the connected load, whereas if grouped and the supply furnished through secondary mains, the transformer capacity can approach nearer the actual maximum load of the system.

In order to reduce the fluctuations of pressure in the lighting circuit, caused by large direct connected alternating current motors stopping and starting, there have been devised several systems which provide separate means of supply for motors and for lights, by providing additional "power" conductors, but in nearly all cases such systems necessitate the installation of primary transformers on the premises of the customer. With a view of furnishing a single service to the customer without installing apparatus on the premises, there are 1 or 2 systems employing 4 or 5 low tension conductors in the secondary, from which different combinations of pressure are secured for the separate operation of motors and lights, but such systems have not been put to extended central station use.

But if the alternating system has not yet attained the standard of a large distributing system for compact territory, it is nevertheless alone in its field of transmission and house-to-house supply in scattered territory, and yet even in these fields too much attention cannot be paid to the consideration of future permanent supply, there being many cases of its having been used as a very temporary means of "getting there." A generator is bought, a few miles of small sized conductors erected, enough transformer capacity installed to supply present wants, the installation is complete and trouble begins. When extra transformers are required, they are purchased one by one in small sizes and connected to feeders already too small to carry the load. The idea of a change in the size of conductors never occurs, and soon the station manager does not think much of the alternating system, and by that time the public generally agrees with him. This state of conditions is due to the fact that the system has not been designed with an idea of permanency, and the future and uncalculated demand upon it completely destroys its usefulness. Such a state of affairs existed in the pioneer days of direct current engineering, the future demands seldom receiving the consideration which they warranted. Inspectors "determined" the system and visited every corner of the city, every private house, hotel, etc., and finally "determined" that the heaviest direct current mains in the business section should be 27,000 cm. and the feeder 41,000 cm. Three years later, in the same city, these mains were replaced by others of 8 times the capacity, and were even then too small. Such was true of the simple direct current system, and it was even more true of the alternating system. The idea that the alternating high pressure system saves copper, and that therefore it may be possible to save it all, has often brought about a final failure of a promising success.

What is required to-day, however, if the alternating current, besides retaining its field of transmission and scattered distribution where it is supreme, would enter the compact direct current field of distribution, is:

1. A standard type of motor, which can be used for all classes of business demands and will meet the same commercial requirements as the present direct current motor.

2. A universal system of supply, which does not require transformers, etc., or anything outside of the meter itself, to be located on the premises of the customers.

3. Some apparatus which, in connection with alternating current, will take the place of the storage battery supply on the direct current.

With these requirements complied with, the alternating current distributing systems can expect to take the place of many of the large direct current systems, not only for the supplying of light, heat and power, but also for transportation.

The Hubbell Riveting Machine.

Mr. Harvey Hubbell, of Bridgeport, Conn., is putting upon the market a new riveting machine, which will take work up to $\frac{3}{16}$ of an inch. The illustration gives a good idea of its working form. The foot lever is connected with a bell crank which operates a hardened steel bolt, pushing it under the hammer spindle at the top of the stroke, stopping the machine instantly. The hammer is caused to rotate by a ratchet device that operates on the up stroke The spindle strikes about 900 strokes per minute. The blow is adjusted by changing the tension spring on the hammer spindle. The table is adjustable by being clamped on a gibbed way, and is rigidly held in place by a piece of metal inserted in horizontal grooves planed in the pedestal, and has no chance to jar down. The weight of the machine with countershaft is about 300 pounds, the height being 60 inches and the floor space 20 by 12 inches.

The Puzzling Course of Trade.

Iron Age says that the manufacturers and merchants who have been too closely governed by their ideas of prudence during the past 6 months have found their judgment at fault. The course of trade during this entire year has borne a close analogy to the course of the stock market the previous year. All who took a hopeful view of the situation and manifested their confidence by freely covering their requirements have been on the winning side. Those who thought it well to be prudent and that a change was probably due in the direction of lower prices and a reduced volume of business find that they have been mistaken. The year has been a remarkable one in this respect. Many of the most experienced members of the iron and steel trade who have been governed largely in their operations by recollections of what occurred after former periods of extreme activity have endeavored to apply their experience to the conditions confronting them this year, and have been surprised to find themselves out of step, so to speak. The active conditions prevailing this autumn were foreseen by comparatively few. It was expected, as a matter of course, that the lines immediately affected by the strike during the summer months would have a season of very great activity because of the heavy accumulation of business. It had not been supposed, however, that the effect of the activity in these lines would by any means be communicated to other branches of trade. In this respect the most astute observers of the signs of the times have been deceived. It will be recalled that during the early summer months those who are in the habit of placing season contracts for large quantities of iron and steel were quite conservative in their purchases, being of the opinion that before many days a period of comparative quiet would rule, and that prices would then probably be lower. They found, however, much to their surprise, that by the time they expected prices to collapse a great change had occurred in the temper of the trade, and that values were on the up-turn, and they were compelled to make additional purchases at considerably enhanced prices.

It is noteworthy in this connection that the machinery trade keeps up its remarkable activity. This branch of business, it was thought, would be sharply affected by the great falling off in the foreign demand for American tools and miscellaneous machinery. Individual establishments are feeling this diminished demand to some extent, it is true, but taking the great mass of machinery establishments, they are reported to be not only actively employed, but are in possession of orders which insure several months of activity, even though new busi-

ness should materially decline. This condition of the machinery trade shows more emphatically than almost any other line how general a condition of prosperity prevails throughout the country. Naturally a great deal of the demand for machinery comes from manufacturing establishments impelled to make improvements by the heavy demand for their products. It always happens that when such a condition prevails the machinery trade feels a double impetus. It is stimulated not only by the demand from manufacturing establishments, but also by the necessity for increasing the equipment of the machinery manufacturers themselves. Seldom has greater activity been shown in the enlargement of machinery establishments than during the current year. This enlargement still continues, and projects are steadily going forward involving new investments in this line and promising continued activity.

The only danger existing in the situation as presented is that inasmuch as prudence and conservatism have latterly been somewhat costly virtues, therefore a disposition may develop to depart from these principles. Within the past two weeks such indications have appeared in some quarters. Those who feel disposed to make rather reckless purchases are actuated by the belief that prices are likely to be higher, and expect to reap substantial benefit by making contracts at such prices as are now prevailing. In view of the apparent policy of the leading manufacturers of iron and steel, higher prices are not now regarded as probable. It is believed that it is the intention of the leaders in the trade to keep prices at about the present level and not permit them to seriously advance. Under such conditions the covering of requirements of a reasonable period would seem to be all that is necessary. Business conditions abroad are by no means reassuring, and it is not unlikely that at an earlier day than many expect we will feel the effects of the trade depression existing in other countries. If this occurs those who are not burdened with obligations to receive material will find themselves in better shape to endure the changed conditions than if they must provide for deliveries of material contracted for at higher than the then ruling rates. The old fashioned doctrine of prudence in business may occasionally prove to be unprofitable, but in the long run it cannot be anything else than satisfactory, and this is not the time to depart from it.

Texas Oil as Fuel for Locomotives.

The Gulf, Colorado and Santa Fe, according to data presented in the *Railroad Gazette* has made more progress than any other railroad in Texas in equipping its locomotives to burn oil, and Mr. T. Paxton, the master mechanic, has furnished some interesting data in relation to the work.

The Gulf, Colorado and Santa Fe now has 15 locomotives converted from coal to oil burning and 75 will be converted as soon as the work can be done. For the present this road will use oil for locomotive fuel as far north as Cleburne, Tex. So far the work has been somewhat experimental, and the details of the plans may be modified from time to time as a result of experience.

In an ordinary locomotive the grate is taken out, the lower part of the firebox lined with firebrick, and a brick arch or deflector built in front of the tube sheet. The length of the bricks forming this arch is determined by the width of the firebox. For side walls and the inverted arch ordinary commercial firebrick is used. Experience on this road has shown that firebricks which soften under heat are preferable, as they form a bond which adds strength to the wall and prevents its shattering under the shocks incident to service. Firebricks which have very high heat resisting qualities and which tend to crack when cooling are said to be of little use in a locomotive burning fuel oil. In all cases the burner is located below the mud ring, the grates are removed and an inverted arch is put in the ash pan. The oil may be introduced at the front or back of the firebox, depending upon the shape of the ash pan.

Two forms of fuel oil burners are being used. The Lundholm burner is said to give very good results. The Booth, a patented burner, is used quite extensively on the California lines of the Santa Fe, but only experimentally on the Gulf, Colorado and Santa Fe. The Booth oil safety valve, which controls the discharge of oil at the bottom of the tank, is used. The valve is opened by a bell cord running into the cab and is closed automatically in case the engine breaks away from the tender.

The tanks for carrying oil are placed in the space between the wings of the water tank, which is usually occupied by coal. On passenger locomotives the oil tanks hold 1,850 gallons, and on freight engines from 2,000 to 2,200 gallons, according to the size of the locomotive. A tank is placed in the coal pit, and is coupled through suitable rings and gaskets to a large flat tank which lies on top of the tender. The oil tanks can easily be removed in case it is desired to return to the use of coal. In switching service the oil tanks contain 1,000 gallons. The tank is then made to fill the coal pit and it projects high enough to give the required capacity in a single tank without blocking the sides of the tender or interfering with the view of the engine man.

For discharging oil from the tanks to the burner, air pressure not exceeding 10 pounds is used. Steam is used as a vaporizer, combining the steam with the oil in the burner. In localities where low temperatures prevail, or where the oil lacks fluidity, it is found desirable to interpose a heater box between the burner and the oil tank, in which the oil is raised to as high a temperature as possible with steam before it goes to the burner. However, the high fluidity of the Beaumont oils, the small effect on the oil of low temperatures and the location of the road in the South, render the heater box less of a necessity on the Gulf, Colorado and Santa Fe than would usually be the case.

For supplying the locomotive tanks with oil, delivery tanks and standpipes are erected. The oil is furnished to these delivery tanks from large storage tanks of 37,000 barrels capacity.

On the Gulf, Colorado and Santa Fe, with present prices of coal, there is a saving of from 25 to 40 per cent. by the use of fuel oil. The lower figure applies near the source of the road's coal supply, while the larger saving is in the vicinity of the oil fields, the cost of transporting the fuel being a determining factor in both cases. Other important economies following the use of oil which can only be estimated are: Avoiding all claims for damage by fires set by locomotives; the reduction of clinker pit expense, and greater expedition in handling locomotives at terminals. Other advantages follow the use of oil fuel, such as: Freer steaming and freer running locomotives and consequently greater ability to handle maximum loads; a uniform grade of fuel makes it practicable to adjust draft appliances to get the best results under all conditions; owing to the easy and exact regulation of the fire possible with oil there is a further economy as the labor of firing coal conduces to extravagance in its use. Mr. Paxton points out that an important point to be observed by firemen on oil burning locomotives is to so regulate the rate of combustion as to avoid overheating the firebox plates. It is possible, in firing with crude oil, to burn off projecting rivet and crown bolt heads, as the heat may be made so intense that radiation through the plate does not carry it away fast enough to protect the sheets. In localities where the feed water contains impurities which form hard scale on the plates, this trouble is augmented owing to the lower conductivity of the scaled plates. It is of less importance where the water is so soft that the firebox plates are always clean. This is a thing, however, which is wholly under the control of the fireman, and if care is taken there should not be serious trouble.

The Gulf, Colorado and Santa Fe Company is also having 5 engines built at the Baldwin Locomotive Works which will use oil as fuel. These are 10-wheel passenger engines having Vauclain compound cylinders and Vanderbilt fireboxes. The latter are circular corrugated fireboxes, placed inside the boiler barrel, in the same way that corrugated furnaces are used in marine boilers. For burning oil they are lined at the rear end all around, and on the bottom and up to the center in the forward part, with firebrick. For burning the oil the Booth injector is used.

The estimated weight of these locomotives is 135,000 pounds on the driving wheels, and 40,000 pounds on the engine truck; a total weight of 175,000 pounds in working order. As the complete interior of the cylindrical firebox becomes heating surface when oil fuel is used, except for one opening in the bottom, the amount of heating surface in the firebox is very materially increased, and therefore the total becomes correspondingly greater. Calculated on the basis of the mean internal diameter of corrugations, the heating surface in the firebox is about 177 square feet, and the total heating surface thus becomes about 2,988 square feet. One important point should be considered in its relation to the Vanderbilt firebox, namely, the extreme care that is required of the fireman to avoid burning off staybolt and rivet heads in the ordinary firebox. It is apparent that in the clear field offered by the cylindrical firebox, much, if not all, of such precaution becomes unnecessary. These locomotives can probably be forced as much as desired, as long as ordinary care is used to set the burners in a way that will not concentrate a blowpipe action on any part of the exposed steel.

From reports of experience with the cylindrical firebox in bad water districts, the impression is that the corrugated form, by its action in expansion and contraction, has a tendency to disintegrate hard scale deposits on the crown, and thus keep the deposit falling and the metal free from danger of scorching. This also is a distinct advantage in burning oil fuel, and it will be very interesting to compare the work of engines of the same class, but having in one case ordinary fireboxes and in the other Vanderbilt fireboxes.

The Position of the Engineer in Municipal Service.

[Extracts from the address of A. Dow, Mem. Am. Inst. Elec. Engrs., at the last meeting of the Detroit Engineering Society.]

You will find my text in the Detroit *Evening News* of April 5th, where one of the Public Lighting Commissioners is quoted as saying:

I used to think that municipal ownership was a good thing, but my experience has taught me that it is impossible to divorce public business from politics. It is all politics, and just now the Public Lighting Commission is composed of 2 Republicans and 4 Democrats.

My experience is different from that of the commissioner quoted. It has taught me that it is entirely possible to keep public business separate from politics, even the public business of that very commission. My experience has led me to believe it possible to divorce public business from politics after the two have formed such an unholy alliance. To keep them separate in the beginning was the work of an engineer, and I now propose to tell how it was done.

The first Lighting Commission was absolutely non-partisan. In its constitution there was the usual recognition of each of the great parties, but each of those 6 men stood for the whole city and never for a moment for his own political friends. That was as it should be. A bi-partisan board is not a non-partisan board. You cannot neutralize 3 aggressive Republicans by appointing 3 equally aggressive Democrats. Two blacks don't make one white, and the result in practice is at best a deadlock. If by any chance a Republican partisan votes with the Democrats, he is called a traitor, and there is a howl for his political scalp.

This non-partisan commission decided that its duties were essentially legislative. Its members were business men who certainly could not give attention to details of commission work. You remember that these commissioners are unpaid—well, perhaps I should not put it so, but the payment they get is of the kind best described by a tale concerning our fellow member, Mr. Frank E. Kirby, who served a term as a Water Commissioner of this city. The Water Board of a large eastern city visited Detroit in the course of a tour in search of information. Mr. Kirby dropped his other duties to entertain the visitors, one of whom in conversation, spoke as follows: "In our city there are 3 water commissioners; we each get $3,600 a year. How many are there of you in Detroit, and what do you get?" The answer was grim, but precise, "There are 5 of us, and we get hell." The first Lighting Commissioners were well paid in the coin named by Mr. Kirby. Some of them are, I think, still receiving small instalments of their salary.

Be that as it may, they decided that their duties were legislative, and therein they made a wise decision. They sought as their executive an experienced electrical engineer of good administrative ability. They failed to be satisfied by any of the numerous applicants who asked for the position; they made guarded inquiries concerning a number of men who were engaged in such work as they had to do, and they ended by offering the appointment to a man who was about as thoroughly surprised as any one could be by such an offer. That was me.

From the beginning, the separation of legislative and executive functions was complete. The commission decided on a policy. I reported on and advised as to possible plans whereby that policy could be carried out. The commission authorized the execution of a general plan presented by me, and then it became my duty to carry out that plan, myself selecting the immediate agents and settling the details. On me lay the responsibility for results. Logically to me was given the choice of means.

Given full charge of the work and the force; given power to employ and discharge help; ordered positively to see that each employee earned his pay; to require no qualifications other than citizenship and competence; to disregard all indorsements which were not supported by my observation of the work actually done for the commission, it would appear that I should have been able to keep practical politicians out of the service of the Public Lighting Commission. Did I do so? Well, I think I did. I was convinced of it by the fact that the Republican politicians of the city condemned me for a Democrat, and the Democratic politicians cursed me for a Republican.

I began, so far as the laborers and mechanics were concerned, at the top of the long list, which was arranged according to priority of application. I called for these men in bunches, sized them up personally after the fashion of all engineers who have to hire men. I questioned them as to their citizenship and previous experience, rated them according to their claims and set them to work. I personally hired each man, and the hiring was a big part of my work. In a short time I could tell whether or not a man was competent. If he showed himself such he remained in the service. Some of the men employed in this way 7 or 8 years ago are still on the Public Lighting Commission's payroll. If a man showed himself incompetent, he was summarily discharged. The orders of the commission were that no man should have a time appointment; that each man should be hired from day to day or from month to month.

There was an application blank which had spaces for name and address, trade or profession, previous experience and references. The references were often autographic. The rule that a man should be a citizen and a bona fide resident of Detroit led to many of the applicants establishing their status by presenting the signature of one of the aldermen of their ward or some other well-known Detroit man. Our foreign-born residents almost always secured the alderman's signature before presenting their application.

Some of the poorest specimens of mankind that were tried in the service brought the most magnificent indorsements from preachers and from pillars of churches. I honestly believe the average preacher does not know the making of a decent workman. I must expressly exempt the Catholic priesthood from this reproach. I noticed that a man who referred us to his parish priest was always a good find. On the other hand, some of the best men whom I found, including men who are still employed by the commission, carried the indorsements of politicians whose reputations are far from saintly. I don't say that a tough alderman invariably recommended a good man for a job; what I mean to say is that, especially in these years of business depression, the tough alderman could and did furnish from among their constituents enough mechanics and tradesmen, of a thoroughly reliable character, to fill any number of positions such as I had to offer. Of course, the tough aldermen sometimes sent worthless men to me, but I had an effective method of dealing with such cases. If the man proved worthless, I summarily discharged him, and then I did not wait for his political sponsor to come to me complaining that his man had been "thrown down." I made the announcement myself to the sponsor, and followed it up by a few well chosen remarks in the vernacular which let him understand that it was his business to know that a man was a good, capable worker before he sent him down to the Public Lighting Commission, and that if the said sponsor did not know any better than to send such a damnable specimen as the one just discharged I would decline hereafter to consider any of his recommendations.

I commend this prescription to any of you who may find yourselves in such a position as I then was in. The first dose, if liberal, effects a complete cure.

The steam engineers and similar expert mechanics were selected from the list of applicants. In these classes the plan of putting a man to work and seeing what would happen could not be tried with the same freedom as was permissible with laborers. An incompetent engineer might wreck an engine in demonstrating his incompetence; or an unskilled electrician send himself to paradise by the electric route, and thereby cost the city $5,000 or so. It is really remarkable how valuable such a man becomes after he is dead. But the method was modified only in degree, not in kind. A man was first questioned and then tried. His indorsements counted for nothing, his politics for less than nothing.

The relations of the plant to what is called "union labor" were very early defined. The first commission announced that it recognized citizenship and competence as being the only essentials for employment. It classed union labor affiliations together with politics and religion, as being immaterial so long as they did not interfere with the performance of a man's duties. It resulted that we made no inquiry as to a man being union or non-union, and that naturally a large proportion of the men employed were union men. I think the ground taken in the matter was solid, and that it is the only ground which promises permanent freedom from trouble.

It was not sufficient to obtain employees who were free from political obligations. It was necessary that they should remain clear of such entanglements. Our rule in the beginning was clearly stated, and it was reiterated from time to time as occasion required. It was that every employee should have opportunity to vote at primary and regular elections; that there should be no inquiry as to how or for whom he voted, but that no employee should on any pretense engage in what is called party work. A report that an employee was making himself notable in politics caused him at once to be called on the carpet and notified that a persistence in such activity would surely lead to his dismissal. In the early days of the commission it was necessary, in more than one case, to warn men individually of the consequence which would follow their persistence in political activity. These warnings took the form of a tatement that the Public Lighting Commission was non-partisan; that

the retention on the roll of an active partisan of either party would lead to demands from the other party that some equally active partisan of that stripe should be employed; that the Commission did not propose to engage in any such balancing of evils, and that, therefore, the employee must limit his activities or quit the service.

No man was ever discharged for political activity. Anonymous charges were occasionally made that men were discharged because of their politics, but the record was easily cleared. These charges were all made in the early days, when each party said I was a vile tool of the other party.

For five years—three years of my service and two years of my successor's term—the relations of the Commission to its electrical engineer were unchanged. You will recognize that these relations were essentially those of a board of directors of a corporation to their general manager. In my own case they were exactly the relations which I now hold to the directors of the corporations whose property I manage. They were the relations which exist in every such department in every city whose work is well done and free from political taint.

In Canadian cities the man in charge of public works is usually a civil engineer, and he is actually in charge. The Public Works Committee has legislative functions only, and a law duly enacted, not merely a ruling of a commission, prohibits the activity of any city employee in politics.

I have spoken of the successful operation of the public lighting plant while the functions of the commission and the engineer remained clearly defined.

It is now in order to tell what happened when this definition became hazy. After five years' operation of the plant, ill-advised economies, insisted upon by the board in direct opposition to the advice of the engineer, caused a strike of the arc lamp trimmers. The question of detail was whether the trimmers did or did not do enough work for their pay; whether, in fact, their duties were proportionate to their wages; whether they had what in the newspaper discussion at the time was called a "snap." I think the trimmers' duties were no snap, and I know whereof I speak. A man who trims 60 open lamps on a circuit of average length daily, Sundays included, summer and winter, in fair weather and in foul, in the early hours of the summer morning and in the bitter sleet storms of our winter and early spring, has no snap if he does his work properly. Electrical engineer Steele told the commissioners this. They overruled him. Be this minor fact as it may, the major fact was that the commission, to secure a small economy of operation, overruled its executive officer and ruined the discipline of the plant.

The damage to the commission, directly and indirectly, by the loss of discipline, from that day to this, by the loss of capable employees and the expense of educating others, has offset many times the saving which was expected to be made. The commission assumed control of details which, even had it been competent to judge, it could not personally oversee, and deliberately permitted employees to feel that they had a grievance.

The engineer did his best. He won the strike for the commission, feeling that his duty to the city overrode his sympathy for the men; but thereafter he avoided responsibility, knowing that he could not depend on the support of his directors, and the clamor raised by the aggrieved employees had its unavoidable result. The appointing power, the mayor of the city, tried to remedy the harm done by nominating a commissioner who undertook to specially represent these employees, and who entered on his duties with a prejudice against his associates. This appointment was followed by another; this second nominee frankly declaring himself the special representative of organized labor. Partisans both of them, these commissioners; well meaning, no doubt, but limited in their action by the circumstances of their appointment, carrying to their duties not a receptive mind, but a preconceived hostility to the past management. At meetings of the board charges and countercharges, criticisms and squabbles took the place of frank discussion and of willing submission to the decision of the majority. Tale bearing by employees was encouraged, different members assuming the protection of different employees of cliques of employees. Matters of detail took up the time of the board, and business was impossible. The plant kept on going from sheer inertia, but the engineer very early concluded that he should end his connection with the institution. He had been wiser for himself, I think, had he come to this conclusion a year sooner than he did; but he, like almost all engineers, was faithful to his salt and tried to do the best for his masters, the public, under adverse circumstances.

My conclusion is that a public works department can be operated efficiently and economically on the same lines as is the service of a private corporation; the commissioners assuming the duties of the directorate of such a corporation and the general superintendent, who must be a thorough, competent engineer, performing all the executive duties. I can admit no exception to this rule. I am aware that in some organizations the peculiar knowledge of individual directors makes their advice exceedingly valuable in the executive department. This was the case in the first Public Lighting Commission of the city of Detroit. Of that commission there was not one man who had not a general knowledge of the apparatus and methods involved in the electric lighting business; three of these had served as directors of electric lighting enterprises. The factory of one was a pioneer in the use of electric power distribution, and the commissioner who knew the least of electrical affairs was surprisingly familiar with the routine and costs of a model street railway plant in which he had an interest, Two of the members had technical knowledge and ability which brought them, in the course of their business, a large recompense, and which they gave freely to the service of the city of Detroit. One of these men had been a pioneer in telephone, electric light and electric railway developments, and he is now an officer and director of one of the largest telephone companies in the Middle West. The other, whom I may name, seeing that he is dead, Mr. Geo. Howard Lothrop, was reputed the best authority on electrical patents west of the city of New York. The advice of these men was constantly sought by me as the executive officer of the Public Lighting Commission, and it was always freely given and always valuable.

I have indicated sufficiently the peculiar fitness of the first Lighting Commissioners of this city to take charge of detail and to perform the executive duties of their department, and yet it was these commissioners, who knew exactly what they were doing and who were, without exception, better fitted for their public work than any of their successors have ever been, who positively declined to depart from their legislative functions and who insisted upon the assumption by their general superintendent and engineer of the full responsibility and the full authority which his executive duties required. It has remained to men of less knowledge to initiate the contrary policy and to fail in it.

Blast Furnace Gas Engines in Austria.

Iron Age says that the powerful stimulus which the iron industries of all countries have received to adopt the utilization of blast furnace gases for working machinery has found expression in Austria, says the London *Iron and Coal Trades Review*. The credit of erecting the first engine driven by furnace gas there belongs to the Bohemian Mining Company, of Vienna, which has just introduced one of 300-horse power at its works at Königshof, Bohemia. This gas engine was made by the the Maschinenbau-Actiengesellschaft of Prague, Karolinenthal, who, in conjunction with the Société John Cockerill of Seraing, have taken up the manufacture of gas motors of the Delamare-Debouteville type.

The gas engine in question is also remarkable as being the first tandem motor driven by furnace gas. It has 2 gas cylinders, located one behind the other, 700 mm. (27.58 inches) in diameter, with a stroke of 800 mm. (31.52) inches). The engine makes 150 revolutions per minute corresponding to a piston speed of 4 m. (13.12 feet) per second. The front piston serves as a cross head for the connecting rod, and is connected by a rod with the hinder piston. The necessary stuffing box in the anterior cylinder, owing to its peculiar construction, does not create any difficulties. The motor, notwithstanding the high number of revolutions and the rapid speed of its piston, works with remarkable smoothness, and in no way injuriously affects the foundation. The fears which many engineers have entertained as regards this point are, therefore, proved to be illusory.

The tandem motor, compared with the system in which there are two cylinders opposite each other and a double connecting rod, possesses the advantage of greater simplicity and greater regularity in working. The latter is owing to the fact that the two motive impulses to any two revolutions are uniformly distributed over the whole, whereas with cylinders opposite each other the two motive impulses take place immediately after each other, and are followed by two dead strokes of the pistons. In consequence of this quality of greater regularity a lighter flywheel can be used for the tandem gas engine.

The jackets, valve boxes and the valves themselves are cooled, and, in addition, both the pistons are kept cool with water, which, by means of a movable pipe connection, is introduced at a pressure corresponding to the speed of the piston. The motor is regulated by means of an air cataract, which, in its action, is very sensitive, and enables the number of revolutions to be easily reduced to any limit desired. According to

the diagram of the engine, with a constant load the motor works with great smoothness. The amplitude of the curve only amounts to 1.5 mm., corresponding to a cyclical degree of irregularity of 1 in 150.

The flywheel is 4.250 mm. (14 feet) in diameter, and weighs 22 tons. The gas engine is coupled direct to a 300-horse power constant current dynamo, delivering a current of 120 volts, which is used for lighting and the transmission of power. The blast furnace gas has a heating value, measured by Junker's calorimeter, of an average of 800 calories per cubic meter.

The analysis of the gas gives the following composition:

CO_2	13.0 per cent.
CO	25.1 "
H	1.9 "
N	60.0 "

The gas taken from the main contains about 2 g. of dust to the cubic meter; it is, therefore, passed through an appropriate cooling and purifying apparatus, after which the percentage of dust is reduced to 0.6 g. per cubic meter, which amount, during a two months' trial of the working of the engine, had not caused any deposit in the cylinders sufficient to necessitate their cleaning. Ignition is effected by means of an electric spark from a Rhumkorff apparatus. The motor is started in a very simple manner; by means of a suitable device a charge of benzene is sucked in and compressed, and by the next manœuver contact is made for the electrical ignition.

The Königshof Iron Works in the spring of this year erected a blowing engine driven by the gases from the blast furnace, which also was supplied by the company mentioned. This blowing engine is, as regards its gas motor part, similar to that exhibited by the Cockerill Société. The air cylinder, on the other hand, is furnished with Stumpf's pressure and Corliss suction valves. This type of blowing engine is simple in construction, and suffices for a blast of from 500 to 600 c. m. If a more powerful one is required two such engines may be coupled together. Among the other Austrian iron works that of Kladno has placed an order with the same firm for a 600-horse power twin tandem motor. This gas engine will consist of 2 tandem machines of the type described, and the cranks at an angle of 180 degrees will drive an alternating dynamo mounted upon the common crank shaft. This engine will, therefore, have 4 cylinders, so that for every piston stroke there will be an ignition, and, consequently, the motor will work with regularity and smoothness.

Novel Condenser in an Australian Electric Plant.

In a paper read before the Société des Ingenieurs Civils, M. Fouché describes a novel form of condenser which is used by a plant in the Kalgoorlie district of West Australia. In this region water is so scarce that it is paid for at the almost incredible rate of $5 per cubic meter (39.4 inches), and it is necessary to economize it to the utmost degree. The present arrangement is quite successful in saving practically all of the water of condensation, and it is thus used almost indefinitely. The Kalgoorlie mines, whose annual gold production reaches $16,000,000 a year, have been heretofore provided with a number of large engines, but those were generally of the non-condensing type and worked under very unfavorable conditions. Consequently a light and power company was former in order to furnish energy to the mines at less cost. The first plant of this kind has 3 vertical compound engines which give a total of 4,500-horse power. The condenser is provided with 27 ventilating fans which send 2,000,000 cubic yards of air against the surfaces of condensation. These surfaces are composed of corrugated sheet steel, and the plates are assembled in pairs to form a corrugated flat chamber. The condenser is built up of a series of such hollow plates, which are joined to 2 conduits, one for the entrance of steam and the other for the water discharge. The condensation is thus carried out under the best conditions. It is found that the plates do not deteriorate if they are protected from the weather, and the apparatus is easily kept in order. Owing to the hot climate the ventilators had to be made especially large and a great quantity of air be forced against the plates. The steam comes from the engines by a 24-inch pipe and passes first into 9 oil separators, then into the condenser, from which the water is taken by 3 pumps. An elaborate system of filters is used to render the water fit for use again in the boilders. Even the small amount of water coming from the separators is used, this being passed first through a charcoal filter, then through a sponge filter. The condenser water, which is nearly pure, is also passed through a charcoal filter. In this way none of the water is wasted. The energy required for the 27 ventilators and 19 pumps is estimated at 120-horse power.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. C. A. Pearson, a son of Mr. W. H. Pearson, General Manager of the Consumers Gas Company, Toronto, Ontario, has been appointed General Manager of the Vancouver (B. C.) Gas Company.

It is said that the Messrs. Seligman & Co., of New York, are investigating the status of the New England Gas and Coke Company with a view to assisting in its rehabilitation.

Mr. N. P. Meginniss, Secretary of the Consolidated Gas Company, of Baltimore, Md., announces that sealed proposals will be received at the office of the Company, No. 19 South Street, until noon of the 19th inst., for all the coke that it will require at its different works for the year beginning January 1, 1902. The requirements of the Company may be safely placed at a minimum of 9,000 tons.

The lease of the Mechanicsburg (Pa.) gas works, which was held by Messrs. Janeway & Logan, having expired by limitation, the plant is now being operated by the Gas, Heat and Power Company, of Mechanicsburg. The plant is to be rebuilt, and the main system is to be largely extended.

Mr. Francis S. Thayer, formerly Superintendent of the gas and electric plants at Warren, R. I., has been appointed General Manager of the properties of the Westerly (R. I.) Gas and Electric Light Company.

Articles announcing the incorporation of the California Gas and Electric Corporation have been filed. Its capitalization is returned in the sum of $30,000,000, and its stated purpose is to "acquire gas plants and machinery and to manufacture and sell gas in the municipalities of San Francisco, Sacramento, Stockton, San Jose, Bakersfield, Oakland and other California cities." Our informant failed to name the incorporators.

The Directors of the Portland (Me.) Gas Light Company have declared a quarterly dividend of 2 per cent., payable the 1st prox.

The authorities of St. Charles, Ills., have authorized the proprietors of the Aurora (Ills.) Gas Light Company to "lay on a supply of gas for light, heat and power purposes."

Mr. James B. Thompson, formerly on the operating staff of the New Britain (Conn) Gas Company, has accepted the position of General Manager to the Rockville (Conn.) Gas and Electric Company.

The proprietors of the Amherst (Mass.) Gas Company are considering the advisability of reconstructing the plant. They should not delay the carrying out thereof at the earliest possible periods.

Early this year the Western Gas Construction Company, of Fort Wayne, Ind., installed one of its improved 8 feet, 6 inches, Low water gas sets at the works of the Detroit (Mich.) Gas Company. Later on a 10 feet, 6 inch set of like design was ordered, and subsequently a third set (10 feet, 6 inches) was placed. All of the sets are now working satisfactorily. In addition to the generating apparatus the Construction Company also placed in the Detroit works four of its "duplex" type of purifying boxes (20 feet by 20 feet, by 11 feet, 6 inches), which boxes are operated by the Western's "duplex" valve.

A gas plant is proposed for Cadillac, Mich. Messrs. F. W. Green and C. N. Cady, of Ypsilanti, Mich., are prominent in the movement.

The date first named for the receivership sale of the franchise and all property of the Huntsville (Ala.) Gas Light Company was Monday, Jan. 6th, 1902. Mr. Oscar Hundley, under whose direction the sale is to be brought off, informs us that the sale will not take place until Monday, Feb. 3d, 1902. All the particulars regarding the proposed transaction will be found on page 977 of our current issue.

Mr. W. A. Learned, General Superintendent of the Newton and Watertown (Mass.) Gas Light Company, writing to Messrs. Adam Weber Sons of this city, under date of the 5th inst., says: "We are highly pleased with the 150-foot chimney which you have built for us. The workmanship has been first-class in every respect. I must congratulate you upon the uniformity of the color of the radial brick and the design of the octagonal base."

The offices of the Bridgeport (Conn.) Gas Light Company have been removed, from 41 John street to 799 Main street, opposite the Barnum

Institute of Science and History. The change will be appreciated by the Company's patrons.

MR. GEORGE F. MACMUN, JR., well known in Eastern gas circles from his connection with the Pawtucket (R. I) Gas Company, has invented a noiseless muffler for gas and gasoline engines of all sizes. "The muffler has been tested thoroughly," he writes, "and actually overcomes the sharp report which comes from the sudden relief of the exploded gases in single cylinders, which happening has very materially been held as a serious objection to the use of gas engines. There are four features which are greatly in favor of the device. First, the amount of space taken up by the installation is less than a third of that required by any other muffler on the market; second, there is no back pressure, which proves that all the products of combustion are expelled from the cylinder; third, it has the same area from end to end as the exhaust pipe which leads from the engine; fourth, the muffler is to be put upon the market at a very low figure."

MR. GEORGE G. RAMSDELL has just returned from a hurried trip abroad taken for the purpose of investigating the working of the inclined retort system, and certain other apparatus connected therewith. On the first of the new year and likely prior to that, Mr. Ramsdell will have an important announcement to make regarding his future business career.

THE Western Gas Construction Company, of Fort Wayne, Ind., has been awarded a contract by the Lincoln (Neb.) Gas and Electric Company for the construction of an improved Lowe water gas set of the type of those recently installed by the Construction Company at Detroit, Milwaukee and St. Louis.

"T. J. M ," WRITING to the JOURNAL from Chicago, under date of the 5th inst., says: "At the last session of the Sterling (Ills.) City Council a franchise was granted to the Sterling Gas and Electric Light Company for a period of 25 years. The agreement provides that the maximum rate for a supply of gas on illuminating account shall not exceed $2 per 1,000 cubic feet, that for fuel use to be sold at $1.50 per 1,000. Prompt payment (within 15 days) is to entitle the user to a rebate of 10 per cent. per 1,000. It is further stipulated that after December 1, 1902, the net rates are not to exceed $1.50 and $1.25 per 1,000 cubic feet, respectively."

THE City Council of Lima, O., seems determined to put the selling rate for gas used on illuminating account in that city at the absurdly low figure of 75 cents per 1,000 cubic feet.

IT can be authoritatively stated that Mr. E. H. Palmer, of Geneva, N. Y., has not yet succeeded in purchasing the plant of the Auburn (N. Y.) Gas Light Company, an option on the properties of which he has held for quite a while.

LAST week it was reported in our "Item" columns that "the authorities of Buckville, Ont., propose to expend $50,000 next season on improving the municipal gas and electric light plants." Brockville is the place that should have b)en named; not "Buckville."

THE capital stock of the Salem (O.) Gas Light Company has been increased to $100,000, from $25,000.

THE proprietors of the Cohoes (N. Y.) Gas Light Company have reduced the selling rate to $1.50 per 1,000 cubic feet, a concession of 25 cents per 1,000. The reduction is effective from the 1st inst.

IT is likely that the franchise of the Superior (Wis.) Water, Light and Power Company will be extended for a period of 30 years. A feature of the ordinance is the declaration that the franchise excludes any other gas company from carrying on business in Superior for the time specified.

MR. SAMUEL TRUMBORE, writing to the JOURNAL from Easton, Pa., under date of the 9th inst., says: "I inclose you a cutting from an Easton paper which shows that on Thanksgiving day 50 years ago I was in the employ of the Easton Gas Company. At that time the holder capacity of the Company was 25,000 cubic feet. Beginning as Assistant Superintendent of the Company, in 1869 I was elected its Superintendent and Engineer, and shortly after my appointment as such I remodeled the works. A feature of the reconstruction was the introduction of clay retorts, to replace the iron ones formerly used. A holder of 132,000 cubic feet capacity was also constructed—the Company's holder capacity to-day is 172,000 cubic feet. No particular additions have been made to the plant since that time, save the placing of several benches of 6's instead of benches of 5's and 3's. It is still a coal gas plant. Before I assumed charge of the works the unaccounted-for gas amounted to 28 per cent., and after much persistent labor I succeeded in getting the loss down to 11½ per cent. I do not know what it is now. In 1876 I built and ran a works in Phillipsburg, N. J., which is located in Warren county, N. J., on the side of the Delaware river opposite Easton. The Easton Company was furnishing gas there to 160 consumers. We started with 22 consumers, and we had a square fight. At the end of eight years we had about 200 consumers and the old Company had 15; then they left the territory to me. Both Companies to-day, I believe, are doing well. I am not in the business now, but am still enjoying good health."

THE Trustees of the Ocean Grove (N. J.) Association have again declined to permit the Consolidated Gas Company of New Jersey to lay pipes in the streets of the Grove for the distribution of gas therethrough. The Consolidated Company's mains are in the adjoining streets of the borough of Asbury Park, which place is in fact only separated from Ocean Grove by a narrow body of water, that is bridged at many points. The real fact of the objection to a gas supply for the Grove, however, likely is, that the Ocean Grove Association owns the electric lighting plant that "does business" in the famous (or otherwise) "Camp Meeting" ground; but the queerest thing of it all is, providing the Trustees will not allow a "foreign corporation" to occupy their streets, why they do not construct and operate a gas plant on the Grove account. For certainly there would be great demand for gas as a means of cooking during the summer days in those abiding places of canvas and wood, where the "campers" congregate in close relations in the revival work. The Trustees of the Grove verily are blind in some respects to a sending along of their worldly interests.

THE residents of the district of New Orleans, La., known as Algiers (it is separated from New Orleans by the Mississippi river) are anxious for a gas supply, and it is probable that the New Orleans Gas Company will shortly find some way of getting its pipes across the river.

THE Springfield (Mass.) Gas Light Company will build a new holder on property now owned by it on the south side of State street. The capacity of the holder will be not far from 1,000,000 cubic feet.

THE final transfers in the instance of the consolidation of properties of the La Crosse Gas Company, of the La Crosse Brush Electric Light Company and of the La Crosse Edison Light and Power Company, all of La Crosse, Wis., have been made. The name of the consolidated concern is that of the La Crosse Gas and Electric Company. Its officers are: President, W. W. Cargill; Vice-President and General Manager, George McMillan; Treasurer, W. S. Cargill; Secretary, James B. Taylor.

THE residents of Rochester, N. H., are agitating the matter of a practical gas supply. Prominent in the discussion is Capt. A. W. Hayes, whose associates now hold a franchise for the carrying on of a corporation known as the Rochester Gas Light Company. The named place is in Rochester township, Stafford county, N. H., and is located near the Cocheco river at a point 10 miles northwest of Dover and 78 miles north of Boston. It is on a branch of the Boston and Maine Railroad. It is quite a manufacturing center and has a population of not less than 8,000—counting in that estimate the residents of the adjoining villages of Gonic and East Rochester.

THE annual report of Mr. A. C. Humphreys, President of the Buffalo (N. Y.) Gas Company, covering the operations of that concern for the year ended, September 30, 1901, in part says: "The sales of gas were increased 8¾ per cent. During the preceding fiscal year there was a decrease of 3 per cent.; during the year next preceding there was a decrease of more than 7 per cent. Natural gas is selling throughout the more thickly settled parts of Buffalo at 30 cents net per 1,000 feet. It is used as fuel, and, with Welsbach burners, for light. Until August 1st of this year it was selling at 37½ cents. Your Company's illuminating gas sold at $1 per 1,000. It is evident that such competition, as long as it lasts, must be difficult to meet. During the year the net gain in cooking stoves and other fuel appliances has been 1,085. This is in addition to these sold through outside dealers. During the two preceding years there was a gain of 2,516 and 2,030, respectively. The net profits for the year were $303,939, and there was required for bond interest (5 per cent. on $5,805,000) $290,250, leaving a surplus of $13,689. The preceding fiscal year showed a deficit after paying bond interest of $1,856, and during the year next preceding there was a surplus of $12,285, this surplus, in spite of the decrease in sales, having been obtained by the introduction of economies in management. Last year your Company was burdened by a long and expensive strike; this year there has been a material increase in the price of coal, increasing the yearly cost by about $50,000, or 8 cents per 1,000 feet of gas manufactured. Economies, however, in other items reduced the net increase in cost per 1,000 to 4 cents. As noted in last year's report, about $14,000 more was charged against earnings during that year than in the preceding year for repairs and maintenance of plant. This year a further increase of something over $4,000 has been made on this account, or a total increase for the year of about $18,000. During the year $24,005.06 was expended for extension of plant, including mains, services and improvements at works.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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England—Aug. Siegle, 30 Lime Street, London.

MONDAY, DECEMBER 16, 1901.

The Market for Gas Securities.

The eccentricities recently developed in the general share market had their full effect on local gas shares; but why that was and is so may not be readily explained. The Consolidated Gas Company is really at its wits' end to supply its consumers, but the "wise" investors seemingly have determined that "things are not always what they seem." Consolidated closed to-day (Friday) at 214½ to 215, lower figures having been made in it during the week. One noticeable thing in the trading was the persistence of "small-fry" brokers in their pursuit of odd lots. City gas bonds are in increasing demand.

Brooklyn Union is returned at 205 to 210, but he would be a clever man who could secure 500 shares at the quoted offering price. Peoples, of Chicago, is not very steady, but it is undoubtedly a good purchase at the market. Syracuse (N. Y.) gas seems to afford opportunity for good investment at anything under 25. The general tenor of the market is not in tune seemingly with higher prices, but there is little doubt that higher levels in values will presently be reached.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$78,177,000	100	214½	215
Central Union, Bonds, 5's.	3,000,000	1,000	109½	111
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	295	305
" Bonds	1,500,000	1,000	00	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	108¾	109¼
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River.. Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000	..	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	135
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	205	210
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅞	1
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works,..	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	95	96
Boston United Gas Co.— 1st Series S. F. Trust....	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	7	10
" " Bonds, 5's	5,250,000	1,000	80¾	81¾
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co..	29,500,000	100	102	102½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore...	11,000,000	100	61¼	61½
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's....	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	380,000	1,000	79	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's....	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	53	55
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	66
" Bonds, 6's	2 650,000	..	99½	101½
Jackson Gas Co	250,000	50	67	70
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	90	94
Preferred	2,500,000	100	102½	108
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	98¼	98½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage....	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	46	46½
St. Paul Gas Light Co.	1,500,000	100	60	68
1st Mortgage 6's.	650,000	1,000	112½	115
Extension, 6's.	600,000	1,000	112½	115
General Mortgage, 5's..	2,465,000	1,000	84	86
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	93	96
Syracuse, N. Y.	1,750,000	100	20	25
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	32⅞	32¾
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	107	108½
Wilmington, Del.	600,000	50	232	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec 11, 1901.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1902, to stockholders of record at the close of business, Dec. 31. Checks will be mailed.

1384-5 LEWIS LILLIE, Treasurer.

POSITION WANTED
BY A PRACTICAL MAN,

Twenty-seven years of age. Understands the laying of mains and services; reading, setting and repairing meters; connecting gas stoves; making lead connections; gasfitting in general; adjusting all kinds of gas appliances. Complaint work is well understood. Is competent in the manufacturing and distributing divisions of gas works.

1383-1 Address, "ST. J.," care this Journal.

Position Wanted
As Manager or Superintendent,

By a practical man, 36 years of age. Has had extensive experience in constructing new and reconstructing old works for both coal and water gas. Is at present Treasurer and Manager of a gas company, and is capable of filling any position. Best of references.

1384-3 Address, "M. S. D.," care this Journal.

Position Wanted
By a Practical, Competent and Sober Man,

Of 27 years of age, with 8 years' experience in the laying of mains and services, setting meters and making lead connections. Is also experienced in the manufacture of water gas. Will go anywhere. Address, "P. J. C.,"

1384-1 Care this Journal.

WANTED,
Position as Manager or Superintendent

Of gas or gas and electric company Experienced in both commercial and manufacturing ends. Development of fuel gas business a specialty. References furnished.

1382-4 Address, "F. J. G," care this Journal.

POSITION WANTED AS MANAGER,

By a hustler for new business. Has experience in selling gas stoves, also in laying gas mains. Understands the manufacture of coal and water gas in detail. Experience in reconstruction of benches and water gas apparatus. Was superintendent of gas works for number of years. Now in charge of new business department of one of the largest gas companies in the Union. Will furnish all required references. Address, "G. L.,"

1384-1 Care this Journal.

WANTED,
Good Second-hand Exhauster and Station Meter,

For plant having about 50,000 cubic feet daily capacity.

Address, "R. L. C.,"

1382-4 Care this Journal.

FOREMAN WANTED.

A young man, of good habits, in a small, modern coal gas works. A knowledge of the working of full depth benches a recommendation. Address, giving age and previous experience,

1383-2 "P.," care this Journal.

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Good, Second-hand 12-Foot Station Meter.

Address,

SEATTLE GAS AND ELECTRIC COMPANY,

1384-1 SEATTLE, WASH.

WANTED,
Second-hand Bar Photometer.

Address, with full particulars and price,

1383-2 "GAS COMPANY," care this Journal.

WANTED,
Second-Hand Apparatus, as follows:

4 Purifier Boxes, about 8 feet by 8 feet by 2½ feet.
1 Five-foot Station Meter.
1 Set Water Gas Apparatus, 4 feet or 6½ feet.

Send full specifications, plans and price, with date of delivery. Address,

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The Best Light in the World

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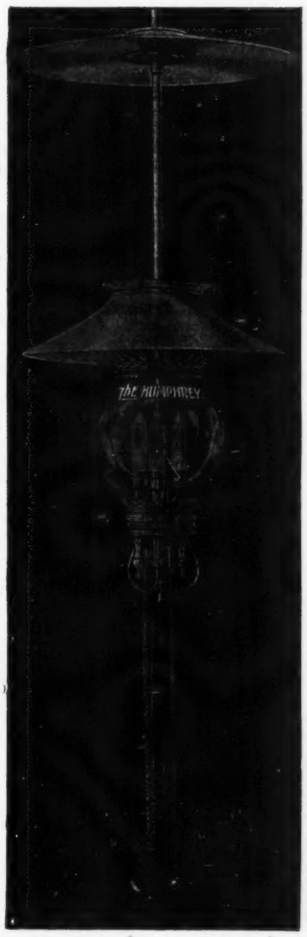
Stores, Churches, Halls or any large indoor areas.

Guaranteed to give a greater volume of light, better diffused and steadier, than an electric arc.

A Complete Revolution in Gas Lighting.

A sample lamp sent on 30 days' trial to any Gas Company.



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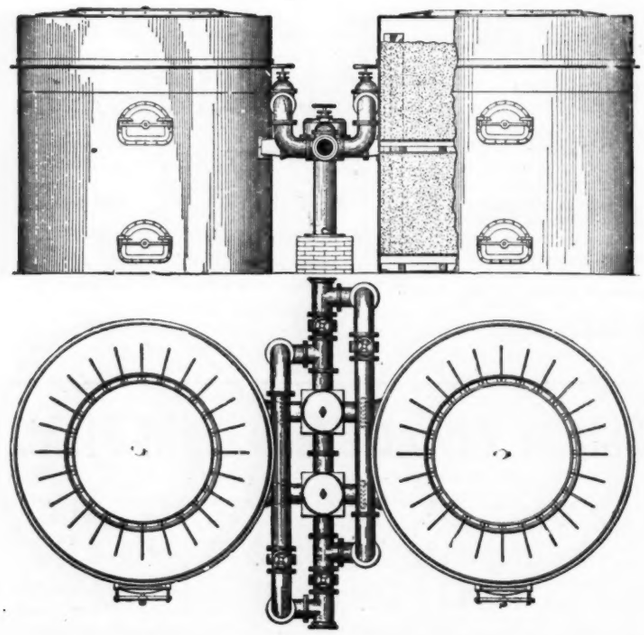

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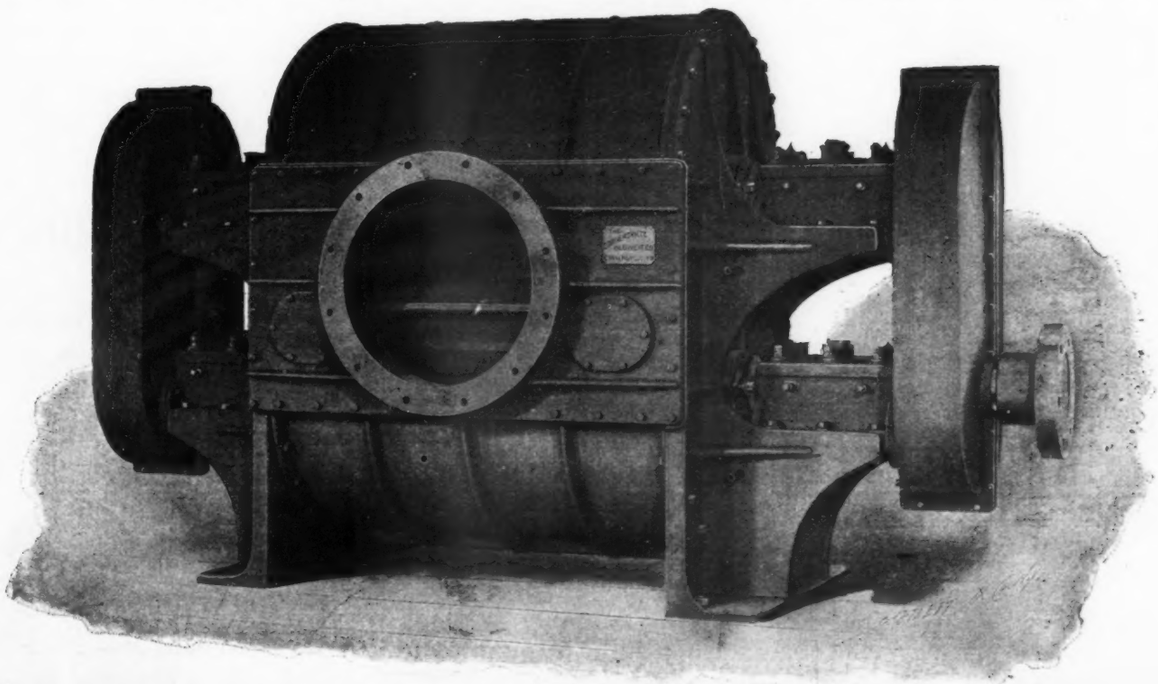

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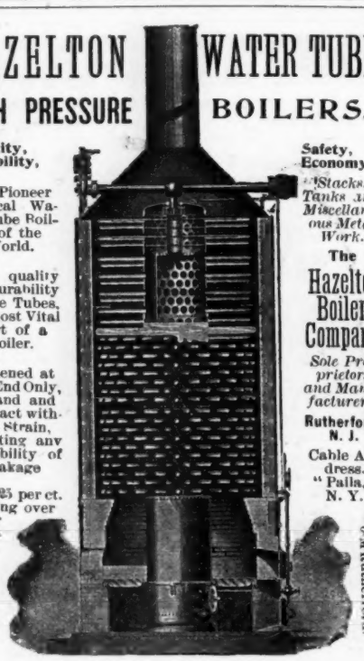

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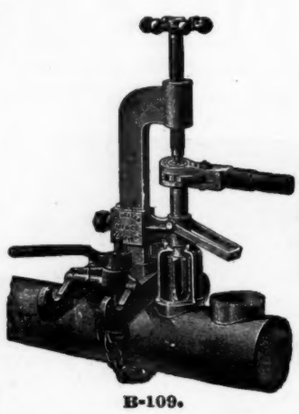

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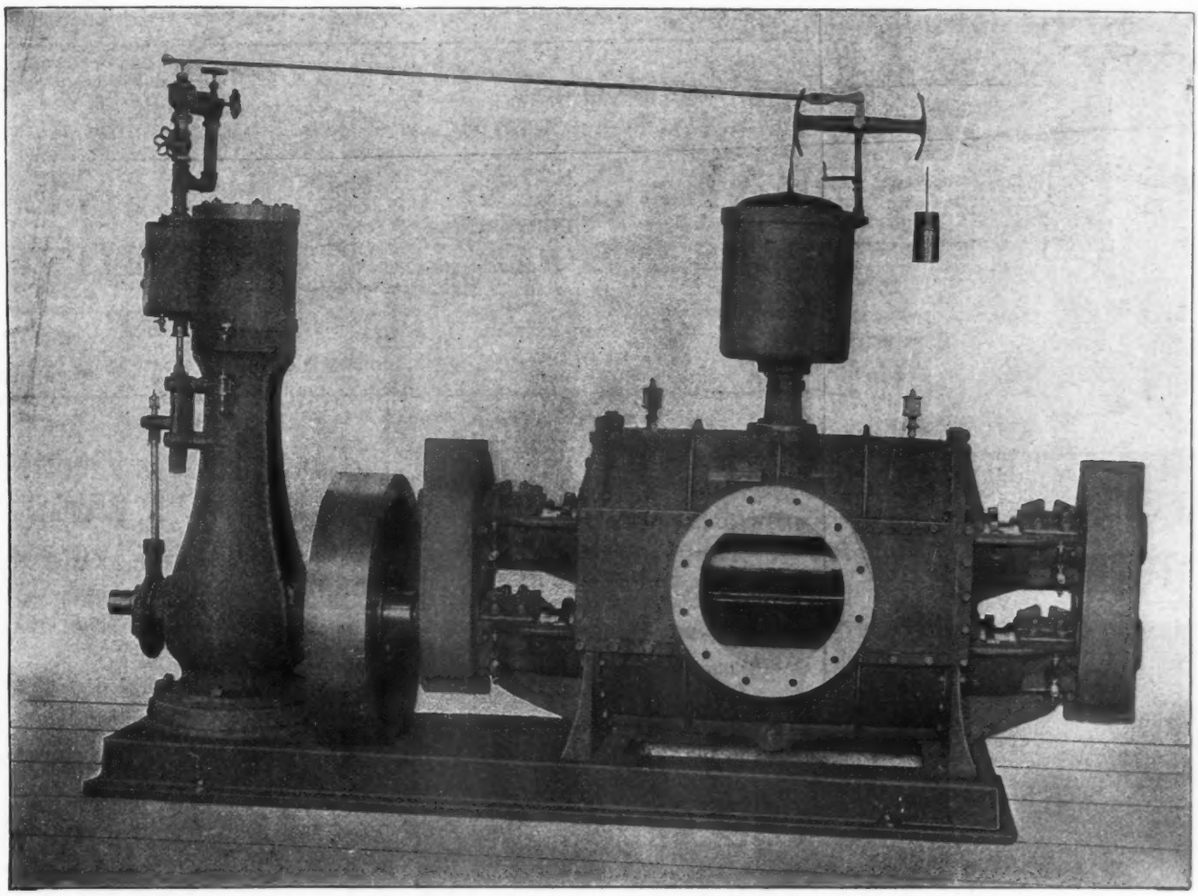

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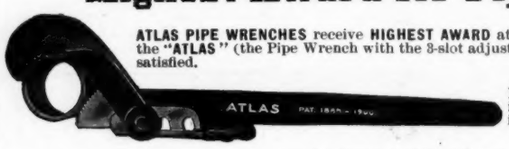

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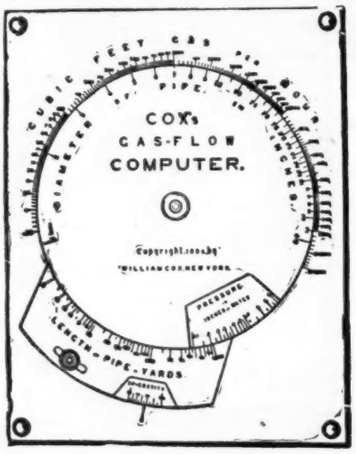

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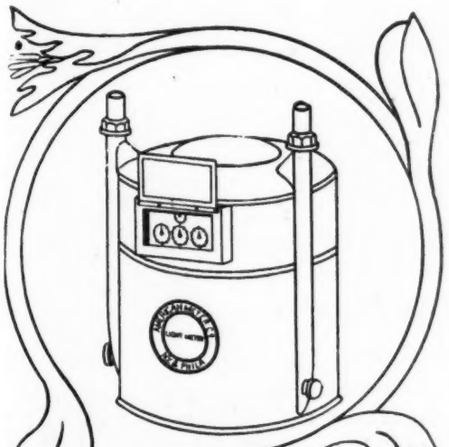

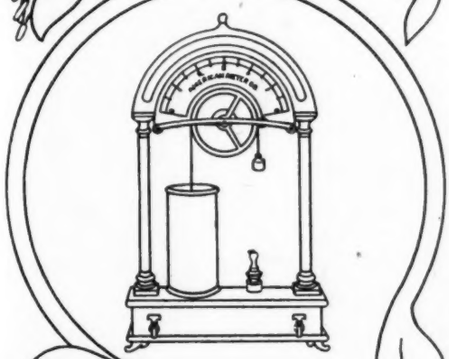

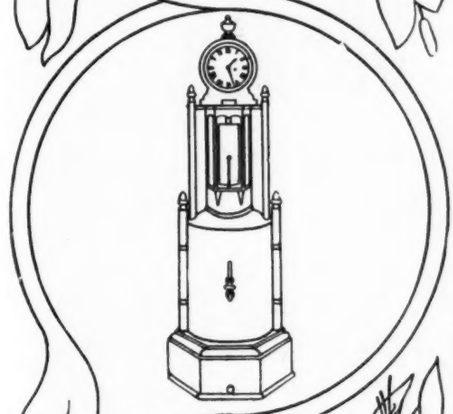

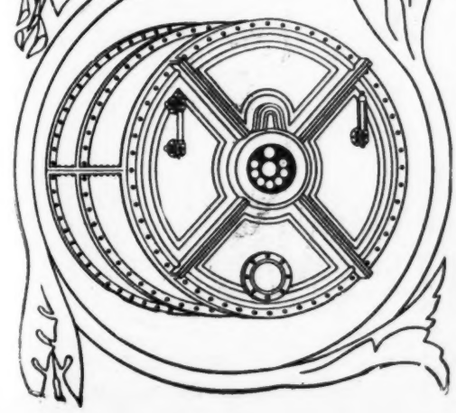

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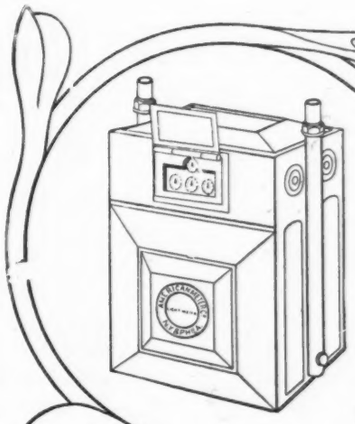
PUBLIC LIGHTING TABLE.

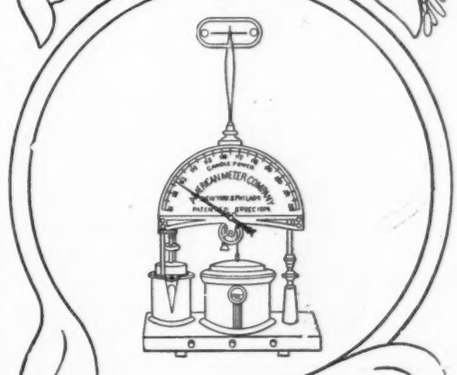
JANUARY, 1902.

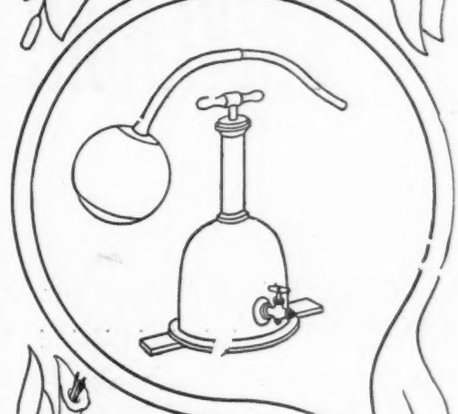
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Wed.	1	5.10 PM LQ	1.40 AM	4.30	6.30
Thu.	2	5.10	2.40	4.30	6.30
Fri.	3	5.10	3.40	4.30	6.30
Sat.	4	5.10	4.30	4.30	6.30
Sun.	5	5.20	5.30	4.30	6.30
Mon.	6	5.20	6.20	4.30	6.30
Tue.	7	5.20	6.20	4.30	6.30
Wed.	8	5.20	6.20	4.40	6.30
Thu.	9	5.20 NM	6.20	4.40	6.30
Fri.	10	5.20	6.20	4.40	6.30
Sat.	11	5.20	6.20	4.40	6.30
Sun.	12	5.20	6.20	4.40	6.30
Mon.	13	5.20	6.20	4.40	6.30
Tue.	14	9.10	6.20	4.40	6.30
Wed.	15	10.20	6.20	4.50	6.25
Thu.	16	11.30 FQ	6.20	4.50	6.25
Fri.	17	12.30 AM	6.20	4.50	6.25
Sat.	18	1.40	6.20	4.50	6.25
Sun.	19	2.50	6.20	4.50	6.25
Mon.	20	3.50	6.20	4.50	6.25
Tue.	21	4.50	6.20	4.50	6.25
Wed.	22	No L.	No L.	5.00	6.25
Thu.	23	No L. FM	No L.	5.00	6.25
Fri.	24	No L.	No L.	5.00	6.25
Sat.	25	5.40 PM	8.20 PM	5.00	6.25
Sun.	26	5.40	9.30	5.00	6.25
Mon.	27	5.40	10.30	5.00	6.25
Tue.	28	5.40	11.30	5.00	6.25
Wed.	29	5.40	12.30 AM	5.05	6.15
Thu.	30	5.40	1.30	5.05	6.15
Fri.	31	5.40 LQ	2.20	5.05	6.15

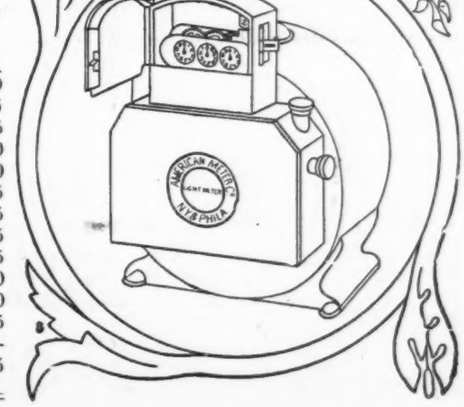
TOTAL HOURS LIGHTING DURING 1902.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	238.30	January	423.20
February	196.20	February	355.25
March	196.20	March	355.35
April	166.40	April	298.50
May	151.40	May	264.50
June	131.10	June	234.25
July	142.40	July	243.45
August	162.00	August	280.25
September	179.00	September	321.15
October	216.30	October	374.30
November	224.10	November	401.40
December	250.00	December	433.45
Total, yr.	2255.00	Total, yr.	3987.45





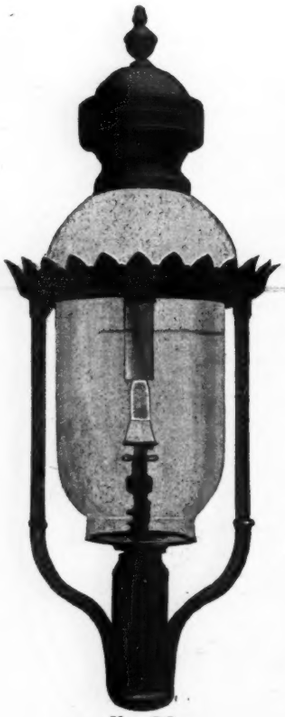




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Controls and Operates the

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Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

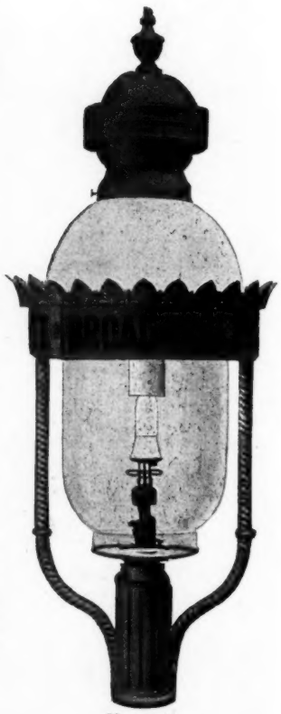
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

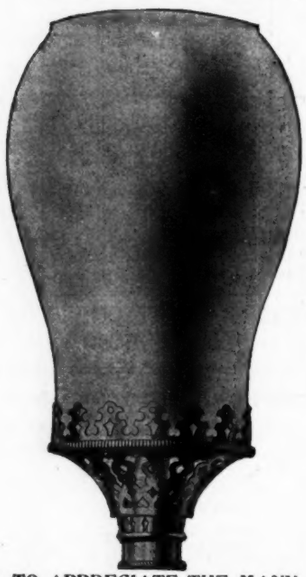
Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.



No. 38.

UNIVERSAL WELSBACH BURNER.



The most practical, efficient and artistic burner yet produced. . . . . .

It contains an improved adjustable Bunsen so constructed as to permit of a wide range of variations in gas pressure without blackening the mantles and without an adjustable air shutter. . .

It can be used with all styles and sizes of glassware, either shades or globes. No further necessity to carry a stock of different burners for the many sizes and shapes of glassware.

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Salesrooms in all the Leading Cities of the United States.

The Standard Double Superheater

Lowe Water Gas Apparatus.

The capacity of apparatus installed, if operated continuously, is sufficient to make more than the entire amount of artificial gas annually sold in the United States.

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H. D ABERNETHY. Sec.

J. H. Gautier & Co.

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Works, Weber, N. J.

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Standard Fire Brick and Gas Retorts.

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Clay Gas Retorts,
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In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

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For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

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Our immense establishment is now employed almost entirely in the manufacture of

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We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

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Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

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FIRE BRICK, FIRE CLAY, AND FIRE CEMENT.

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Sole Agents for New England States.

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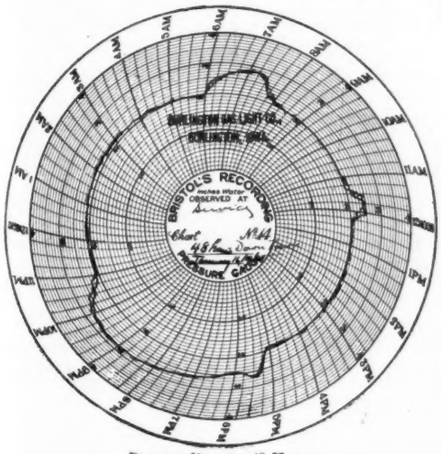
A GAS GOVERNOR,

Particularly a CONNELLY Gas Governor,



DOUBLE RECORD 48 HOURS.

Is as essential to the operation of a gas works as the Governor of any of our great States is necessary to the successful working of one of these political bodies.

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Dear Sir: You are at liberty to keep the pressure sheets sent you recently. If my testimony would have any weight with your prospective customer, you might tell him that all that is necessary to make a CONNELLY Governor just as automatic as the charts we send you indicate, 24 hours in the day and 365 days in the year, is to spend about a half hour's time each YEAR cleaning it. Yours truly, E. D. CLARY, Supt.

Mr. Clary is only one of scores of gas managers who find Connelly Governors absolutely indispensable. We are in business to give you all the information you can wish about Governors.

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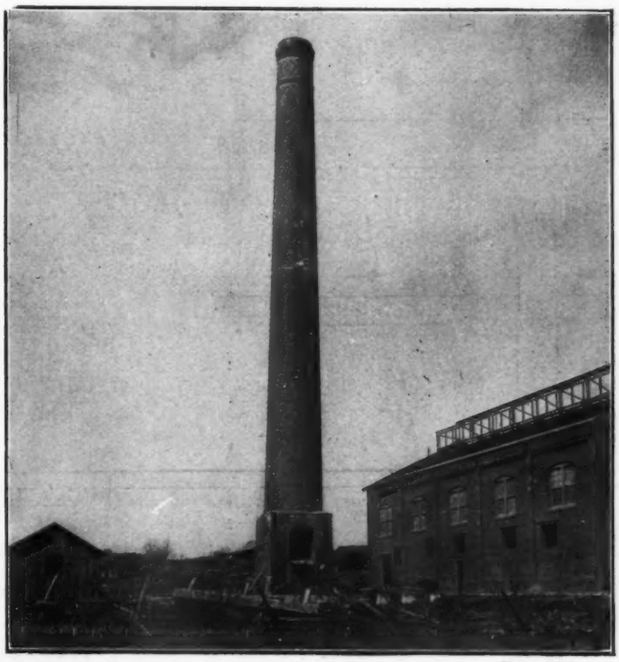
Designers and Builders of Chimneys of Perforated Radial Bricks.



Chimney of perforated radial bricks, designed and built by ADAM WEBER SONS for the Nazareth Cement Company, at Nazareth, Pa.

A. M. Young, President, New England Engineering Co., New York, March 30th, 1901.

Adam Weber Sons, 633 E. 15th St., N. Y. City—Gentlemen: It is a pleasure for us to state that the chimney built for us by you, at the works of the Nazareth Cement Co., at Nazareth, Pa., is an exceptionally fine one. We are certainly pleased with the workmanship on the same, and feel that there is no finer chimney anywhere if construction is considered. Yours very truly,

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The Gas Engineer's Laboratory Handbook,

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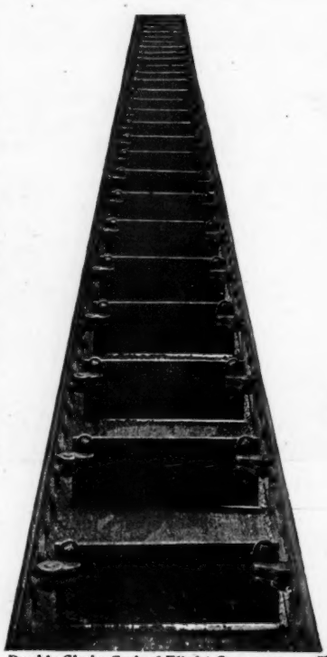
Silver Medal, Paris Exposition.



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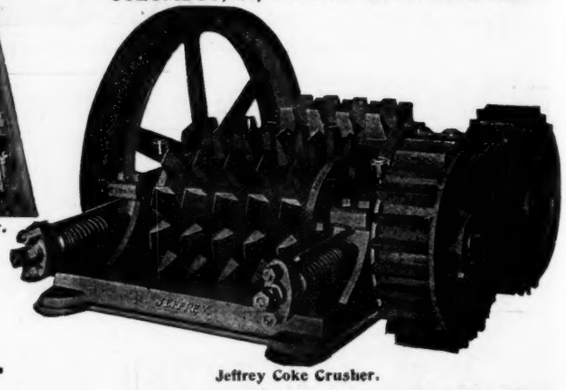

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Strong, Simple, Durable. Will Crush any Size Desired.

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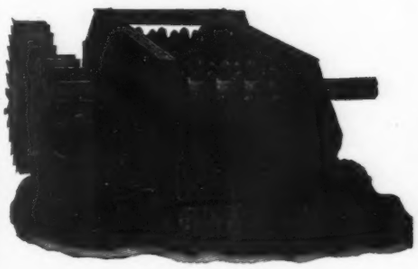

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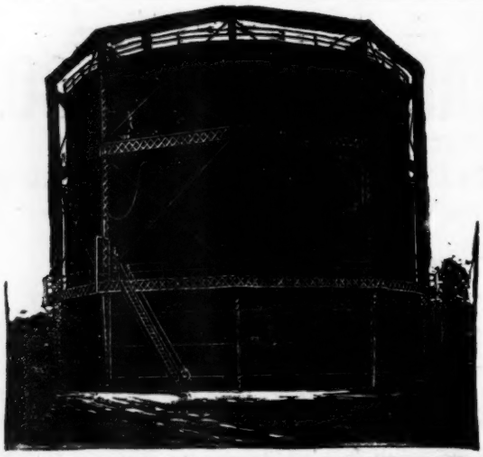

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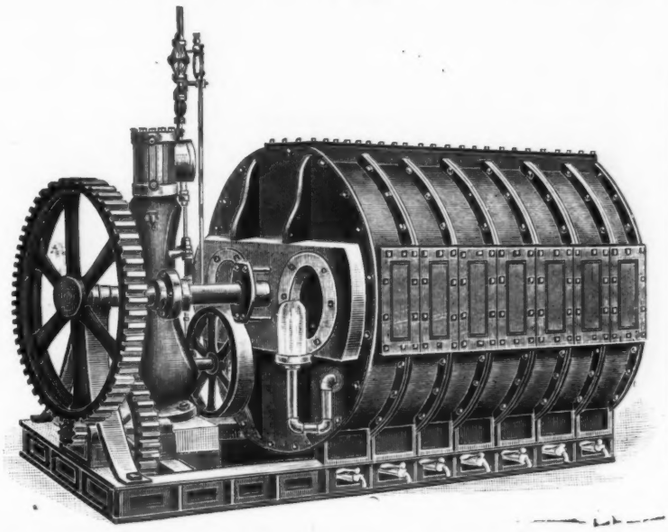

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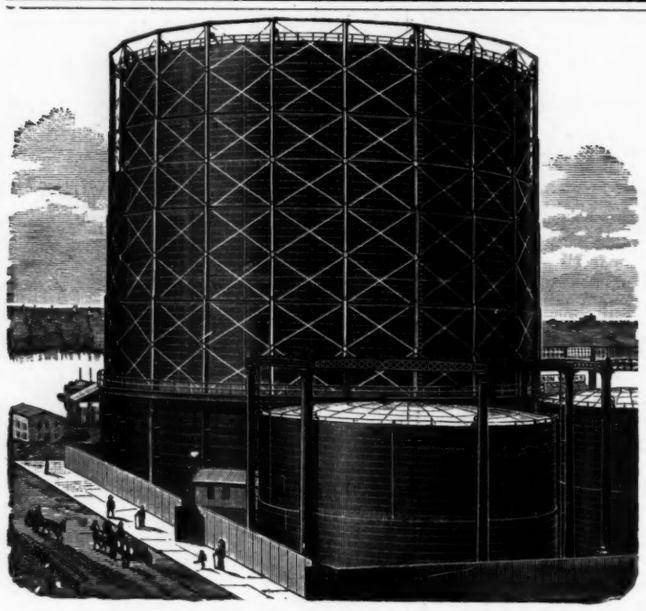

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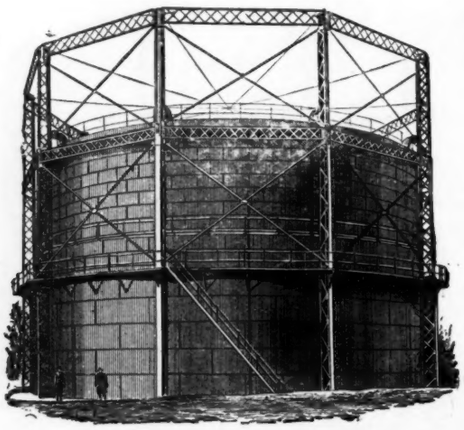

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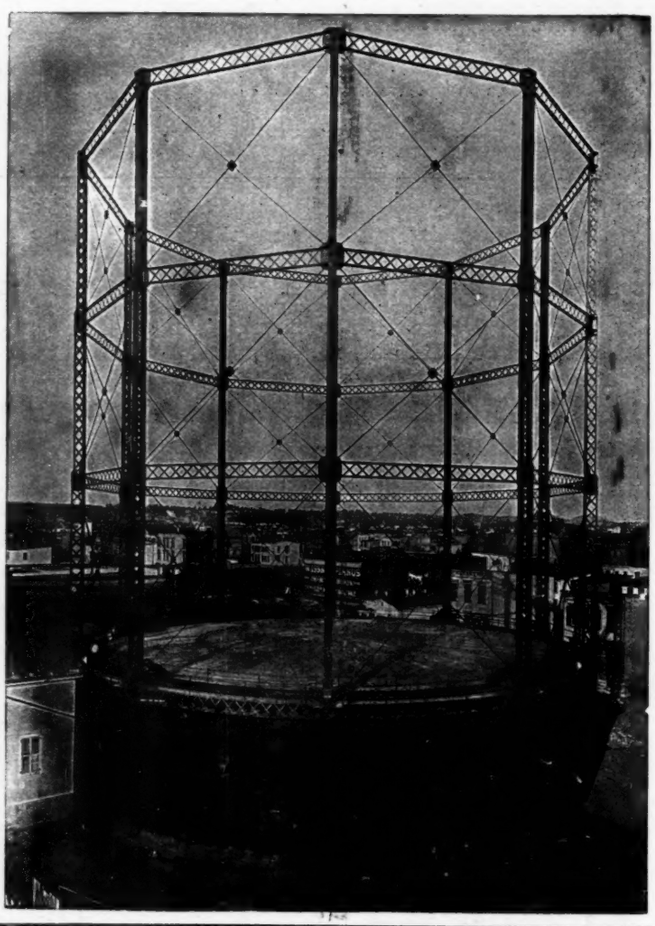

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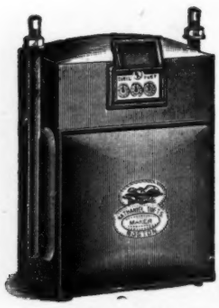

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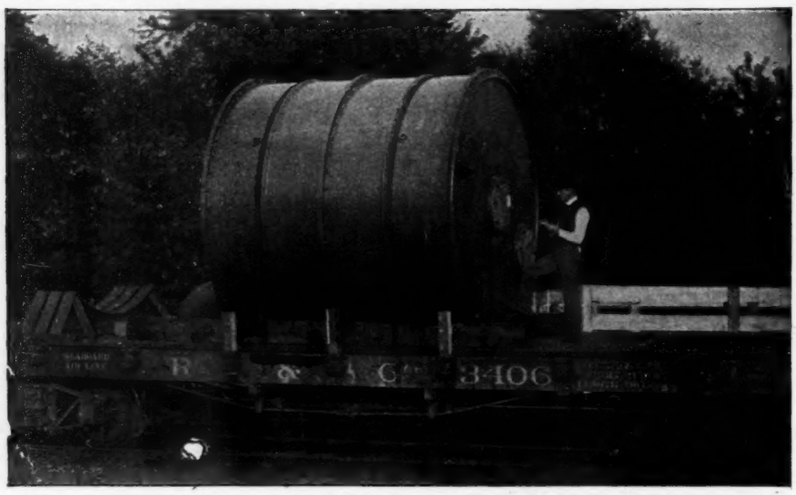

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